# WORKERS WITHOUT WAGE

EDITH CARRINGTON

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# WORKERS WITHOUT WAGE

BY

EDITH CARRINGTON

AUTHOR OF

"STORIES FOR SOMEBODY," "NOBODY'S BUSINESS," "FLOWER FOLK," "BREAD AND BUTTER STORIES," "APPEALS ON BEHALF OF THE SPEECHLESS," ETC.

"More servants wait on man
Than he'll take notice of. In every path
He treads down that which doth befriend him."

*Herbert*

LONDON
GRIFFITH, FARRAN & CO.
NEWBERY HOUSE, 39 CHARING CROSS ROAD
1893

To

ALL WHO STAND UP FOR THE WEAK

TO

ALL WHO SUCCOUR THE OPPRESSED

AND

TO ALL WHO PLEAD FOR THE MUTE

THIS LITTLE BOOK IS DEDICATED

BY A

COMRADE AND FELLOW-LABOURER

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# INTRODUCTION

In order to obviate the unpleasantness of a dislocated style, which is the consequence of constant quotation, and to render the following essays smoother and more easy to be read, the writer has not in every case acknowledged the authority to which reference has been made, or from whose books extracts have been drawn, at the time when such reinforcements have been made to the ensuing pages.

It has also been necessary in many cases greatly to simplify the text introduced; for sometimes great authors use great words.

She begs, therefore, to acknowledge here the great debt due by "Workers without Wage" to the appended list of sources whence such facts as have not been the result of personal observation were taken.

The treatises on Natural History, etc., which have been used for reference, and which are responsible for the main part of the information contained in this little book, are those by Darwin, Galton, Romanes, Carpenter, Mivart, Youatt, Waterton, White of Selbourne, Mayhew, Michelet, Duncan, Kirby and

Spence, Gosse, Figuer, Newman, Lubbock, Buckland, Jesse, Huber, Coleman, and many others; including valuable pamphlets and booklets published by the Royal Society for the Prevention of Cruelty to Animals, which have been freely interwoven with the lessons.

# WORKERS WITHOUT WAGE.

## Fishes.

"To see the fish
Cut with her golden oars the silver stream."
— *Shakspeare.*

If someone were to say that the great ocean, as well as the lakes, rivers, streams, and ponds, teemed with a thousand kinds of water-birds, dwelling below as happily as the feathered flocks do in the air above, it would be thought a strange fancy; and yet fishes are a great deal more like birds than they seem at a first glance.

We know that the proper dwelling-place of a bird is the air; he floats in it, flies through it, or perches upon branches which wave in it. He fills his bones with air to make them light, as well as breathing it. Without air, birds, like ourselves, would quickly die. But when we say that a bird *breathes air*, we do not describe what he does quite closely enough. What is meant by *breathing* air? By breathing we mean the act of drawing air into the body and sending it out again. But the air, when it leaves the body, is not in the same state as when it came in. While the air is passing through the lungs, it is changed; some part of it mixes with the blood and enters every portion of the body;

this is a pure, life-giving part of the air, which is called *oxygen.*

Now this wonderful oxygen gas, or plain *oxygen*, is what keeps us alive. It supports life in men, birds, insects, and all animals alike,—in fishes too. Without oxygen, every creature would soon die. The reason why men and women sometimes feel faint and ill when in close, crowded rooms, hot theatres, or down in mines and quarries, is that all the oxygen has been taken out of the air. Where many people have been together for a long while in a small place, the crowd has breathed up all the oxygen into their lungs, and sent out the air again from their mouths without any oxygen in it, and therefore made it unfit to breathe. If people go on taking the same air into their lungs over and over again, it becomes poisonous; and the same thing poisons animals. It is the *oxygen* in the free, fresh, country air which does us so much good when we go for a walk in the fields, and makes it pleasant and wholesome for us to open our windows.

To make the world fit for animals to live in—to keep it always filled with this necessary, reviving oxygen, the Creator has planned that trees and plants and the herbage with which the earth is covered shall breathe in exactly the opposite way; for all plants do breathe by means of their leaves. These leaves are covered with a multitude of small pores, and are the plant's lungs, by which it is always drawing air into itself; but it draws in that which the animals breathe out—the poisonous air—and they send out instead oxygen, the air which animals want to give them life. So that besides the wind and sunshine and rain which bring it, fountains of this precious gas are always springing from every green thing which is growing healthily; whether

mighty tree, or flowering shrub, or humble grass-blade. If all green things were to die, men and animals must die too. We know that in towns, where green things are fewer, people are not so healthy as in the country. That is because their supply of oxygen is not so plentiful.

Now fishes breathe oxygen; they cannot live without it any more than birds can; and this is one thing in which the two creatures are alike. Birds breathe oxygen out of the air; fishes breathe it in the water.

A second way in which fishes resemble birds is that they are both born in an egg, though fishes lay a soft jellylike kind without a shell; as they do not sit on them, none is needful; and many fishes build nests. Among the prettiest of water-nests is that of the little English stickleback, which the male builds out of small bits of weed. It has a hole at both ends, and when the father is at home his head pokes out at one end and his tail at the other. This little fellow, only about an inch and a half long, is a most careful parent. He hovers about the door of the nest, constantly fanning a current of fresh water towards the eggs, which is good for them, as a current of fresh air is for us. He attacks every other fish which comes near, although it may be twenty times his size, for he is afraid that the stranger wishes to eat up the eggs,—he will die in their defence. When the little fishes are hatched he is even more attentive, leading them about in a little flock, scooping out small basins in the sand where they may play safely, and keeping guard over the tiny things most tenderly, and at the same time most fiercely. The stickleback may be seen protecting his nest in almost any pond through which a stream runs, and should sand or mud be washed over the eggs, he will gather

it up into his mouth, swim to a distance, and send it out with a puff.

Again, the action of a bird in flying is not at all unlike that of a fish when swimming; only, that as long wings covered with feathers would not do in the water, the fish has short fins, which answer the same purpose. These fins are longer or shorter, according to the habits of the fish; whether he lives in rough water or smooth, in deep or shallow streams. In one fish, the fins are so long that he is fond of jumping out of the water, and skimming along by their help some distance through the air; the flying-fish, as it is called, has fins not at all unlike the wings of the swallow, but it cannot flap them.

The body of the fish is covered, not with down,—that would be useless under water,—but with shining plates or thin scales, like silver armour. These scales protect the body of the fish from the water much as feathers protect the bird from cold air;—are not unlike them in shape, and are put on to the body in the same way, overlapping each other after the fashion of the tiles of a roof. They are so fine and frail and delicate, so exquisitely laid on, that they keep him quite dry within, yet do not stiffen his body and prevent it from turning easily as they would do if the coat of mail were less beautifully joined.

The tail of a fish is of very nearly the same form as that of a bird; like a bird's tail when flying, and with the feathers spread out, that is to say.

Fishes migrate as well as birds; they leave one part of the ocean for another part in great shoals at certain times of the year, much as birds of passage do; and one kind, the salmon, migrates from the sea to rivers and inland streams, then back again.

After these points in which they are alike, we shall find nothing more by way of resemblance; but if we go on comparing fishes with birds, we shall see only things in which they are unlike.

The fish, for instance, has no voice like the bird; he is silent;—or nearly all fishes are so. His eyes, too, are made for the dim water-world; they have no lids, nor anything to take the place of a lid. The skylark has a double covering for his eyes, because he soars upward toward the blaze of the sun; but the fish, living in a cool twilight, needs none and has none. The pupil or iris of his eye is fixed and still; it does not contract or expand like that of land creatures, because the light is equal; does not change in the watery depths as it does in the sunny air.

Their ears are quite closed over by the bones of the skull. Some people have thought that fishes could not hear at all; yet as they have ears they must be able to hear, in some measure; though the ears have no opening lest the water should get in and harm them, they answer the purpose of the fish, but cannot attend to any but loud sounds.

As to a fish's power of tasting, that is very slight; his mouth is lined with gristle, a stuff that is nearly as tough as bone; his tongue, which is hard and stiff, has few nerves in it, so that his sense of *taste* cannot be keen. If it were sharp it would be of no use to him, because he swallows his food whole, using the mouth merely as a trap to catch his prey, and not waiting to taste it. Some fishes have teeth for seizing their food, either in the jaws, or further down. The salmon, strange to say, has teeth near the stomach, which act like the gizzard of a bird, chewing the food after it is swallowed.

In fishes, the sense of *smell* is almost, if not quite, deadened. The fifth sense, that of *touch*, is dull too, because the scaly armour prevents the fish from feeling anything unless it brushes roughly against him.

Since his five senses seem so dull, how is it that there is no creature so swift, so quickly alarmed, so wary in avoiding danger as the fish? If your shadow does but fall on the stream where a trout lies, or even where the more sluggish roach and dace dwell, or the shoals of tiny minnows which haunt every streamlet, away they all dart, great and small, quick as thought, more rapidly than any arrow darts through the air; they are all gone so fast that the eye cannot follow. If you drop a stone into a river or pond, how is it that if the fish can neither see, hear, feel, taste or smell keenly, they all vanish like a flash of lightning, scattered more suddenly than any flock of birds by a gun-shot?

It is because, dim as the senses of the fish seem, they are exactly suited to the element he lives in; fitted for the water-world just as finely as those of a bird are to the sky-world. He can see quite as well as he need do, in order to protect himself; and as for his hearing, feeling, tasting, smelling, they work beautifully where they were meant to act, and are sufficient to warn him of all danger. Keener senses would only serve to make his life miserable; as it is, he is among the most gay, cheerful, happy of God's creatures. Fishes at play are a most delightful sight; they leap quite out of the water sometimes, when thus romping, if the sunshine streams on the water, or a shower refreshes it, or when there is more than usual of that delicious oxygen carried by the breeze which ruffles their river or pool. Then the body of the fish glitters for an instant in the air like quicksilver, before it splashes back to its home again beneath.

These creatures have been taught to come at the sound of a bell, that they might be fed with things scattered for them, at a certain hour, from a particular spot on the bank. It is supposed that the fish *feels* the shaking which is made in the surrounding air and water by the sound of the bell, or the slight trembling or thrill in the ground, which spreads to the water when footsteps approach the brink. They may be tamed so far as to lose all fear, and come towards a hand dipped into the water. They will allow themselves to be stroked and caressed by it, and I have myself often taught minnows to gather round my finger; they would nibble at it gently, and finding it not good to eat, pick up the morsels instead which I sprinkled for them. It may be done by sitting at the brink of any shallow stream, on a stone or tree-stump. The watcher will be well repaid by a good glimpse of these most exquisite little creatures, but make ever so slight a sudden jerk, and, as the poet Keats says in a lovely description of a stream where goldfishes bathe and "swarms of minnows show their little heads"—

> "If you but scantily hold out your hand,
> That very instant not one will remain,
> But turn your eye and there they are again."

A little farther back than the eyes of the fish, nearer the shoulder as it might be called, lie two thin plates, called the gill covers; and beneath these are the gills or lungs by which the creature breathes. They consist of a number of thin layers of flesh, looking not unlike that substance which is to be found beneath a mushroom-top. But these gills, unlike those of the mushroom, are placed over one another, not side by side, but as the leaves of a book are. They are quite separate and loose, and are covered with blood-vessels.

The fish draws water in at his mouth and sends it out through these gills; it passes between all the plates or layers, and out at an opening above the shoulder, into the water. As the water passes through the gills all the oxygen is taken in by them; it is mixed with the blood; the rest of the water passes away less pure than when it entered the gills. This does not matter however, because in all streams, rivers, and lakes, as well as in the sea, water is purified by quantities of growing plants, which, like those on land, are always giving out the life-preserving oxygen, and taking into themselves instead the other parts of the water which fishes have made unfit to breathe. Besides this, sheets of water beneath the sky are supplied with oxygen by showers, winds, and the action of the sun.

It is believed that fishes never sleep; but this cannot be proved. At any rate they rest; but as they cannot close their eyes, we cannot tell how far they really go towards real *sleep*. They may be seen supporting their bodies, sitting, as it were, on the sand at the bottom; though a fish, unless dead or dying, never lies on one side. Or sometimes they perch as a bird does on a tree, on the branches of a water plant; though the fish has no claws, he needs none, they would only be in his way—the fins beneath serve his purpose. It is quite possible that fishes do not require sleep, because they have so little to tire them. It is no trouble to a fish to swim; his body is shaped so as to glide through the water almost without effort. Water is very different from air; things which would fall through air will not fall through water, but float on the top. A cork, for instance, will not float in the air, but will do so in water. The body of a dead fish is the same. When the fish is alive his body would float if he allowed it, because compared to the water it is so

light; and water presses equally every way, so that it makes little matter to the fish which way he goes, unless he is swimming against a strong current. It costs him rather more effort to go down than to come up; he drifts without taking any trouble, because his body is scarcely heavier than what he is moving in. It is the first sign of weakness or sickness in a fish, that it will lose the power of *staying down* in the water, and will rise to the surface, partly to get a freer supply of oxygen, but oftener because it floats up naturally, being no longer strong enough to keep below, or to steer itself by means of that marvellous tail, one curl of which to right or left will direct its movements as a rudder turns a ship.

From all this it may be plainly seen that the proper home of the fish, and the only place in which he can be healthy and happy, is the sea, river, stream, or pool, in which he was born to dwell. He cannot otherwise be supplied rightly with that which is the breath of his life, as well as of the bird's and our own,—*oxygen.* In captivity, we cannot supply this in proper quantities to fish; we cannot let the winds and storms of heaven ruffle the sham pond we may have made out of a glass globe or tank, however kindly and carefully we may have tried to replace them; neither can we keep in health for long the groves of waving water-plants so as to supply to our imitation pool what is wanting. It is impossible to bring showers of rain into our houses, or keep away the dust, or feed our water-captives on their natural food, or give them free play, or even space to move properly in.

Nothing can be a more dismal sight than the glass prisons in which the exquisite little gold-fish is doomed to go gasping round and round;—breathing twice as fast as he

would do in his native pond or river, because he cannot get oxygen enough in his close quarters. He grows thinner and thinner day by day, till his poor little body can no longer keep its balance, but begins to be buoyed up sideways, like a dying crocus flower blown by the wind. At last the little glimmering corpse lies motionless, floating on the top of the water which has filled his gaol. He has been dying slowly there ever since he was placed in it; now his sufferings are over: mute, dull, dim as his senses may have been, they were filled with sorrow and discomfort all his tiny life, instead of with the pleasure that God made him to feel. His jailors laid pains upon him such as he was able to know,—though they may have admired and even loved the wee golden thing, they loved their own amusement better. Or else the prisoner-fish is overfed,—upon crumbs, or some other unwholesome diet. His body then becomes a bloated, unsightly mass; his fate is worse than starvation. Without freedom or exercise, and with hardly space to turn round in, he grows more listless and heavy hour after hour, till he too falls a victim to someone's love of colour and life.

Fishes *cannot* be kept in health and comfort for any length of time except out-of-doors, in running water, or water at least exposed to the influences of sun and air, with rain. Those who take the charming little minnow or stickleback, or any other of the pretty little English fishes, and condemn them to an "aquarium," are sentencing the creatures they profess to be "fond of" to a slow, cruel, lingering death. Half of such captives die for want of rest; they are chased and terrified to death; you see them moving round and round their places of captivity till they die, because they want a place of refuge—and to get away. They cannot beat against their prison walls, or flutter, or

cry as a bird does; their misery is silent, but in reality it is the same, though in a lesser degree. For all fish must have, all the more because they do not sleep, darkness to soothe them, rest and quiet. Their eyes are not formed to endure the light all round them, as is the case when they are put into a glass vessel. No wonder that they dash from side to side when first placed in such a thing!—plunging and struggling vainly to escape, trying to bury their heads in imaginary mud which they hope to find at the bottom—knocking vainly against the cruel clearness which they cannot swim through,—the mocking glass sides of their place of restraint. How would you like to be exposed to the full glare of sunlight, without eyelids, or hands with which to cover your face?

The Chinese are not famous for mercy, but even in their country the little gold-fish, a native of it, is treated better than in England. It is placed in china bowls, which have holes made at the bottom as places of shelter.

Better leave the fish in his own world where the Almighty placed him! If you must pull him out of the water, do not let it be for a lingering death at least, or in order to treat him as a toy, an amusement for your idle hours, or even under the excuse of finding out his habits. All knowledge which is gained by cruelty we are better without; it is unlawful knowledge, and will never do any good. There is no knowledge worth having which may not be gained by patient study, without sinning against the God of Love. If we note how carefully the Creator has shielded all animals from pain, it will teach us that He could not possibly have meant us to find out things concerning them which would cost them suffering. We know that this is His will, because the Bible tells us we are never to do a wrong action in order to gain any-

thing whatever by it—and it is wrong to hurt God's creatures wilfully. Whatever we may fancy that it would do good to find out, whatever usefulness we may think will come of it, we must never do evil—that which we should be afraid for Christ to see us doing—to gain any good, or what we may imagine to be useful, either knowledge or any other thing. Fishes do a great work in the world; they purify and cleanse the waters; and that there may not be too many of them, they keep one another in check; larger fishes preying upon smaller; the small on those still less, or on the eggs of large ones. They all alike eat minute water creatures, so small that they are not seen, which they suck from out the water in the act of breathing.

The wonders of the ocean-depths are too great and many to speak of now. We cannot find out a great deal about them, because it is not possible for men to live under water. The ocean-depths are known to the eyes of Him alone who made them; "Whose way is in the sea; Whose paths are in the deep waters; Whose footsteps are not known."

Yet we have found out that the sea-bottom is not a sad, empty, lifeless waste; but a fair garden of living flowers which blossom, yet eat and drink and move about like the sea-anemone. There the rocks swarm with beings so strange, so marvellous, and, although to be counted by multitudes, so perfect and so different each from each, that we can only adore the Maker and wonder at His works in silence.

The great sea-fish which the fishermen draw to land we all have opportunities of seeing in shops, when they are dead, but this can give us no idea of their beauty, the grandeur and grace of their movements, the shining radi-

ance of their look, when they were alive and happy in that ocean home.

When fish are taken from the water all humane fishermen kill them, great and small alike, by a sharp blow at the back of the head, and not leave them to suffer and die slowly.

We have seen that fishes, like ourselves, breathe oxygen; a fish on land dies for want of that, just as a man would die for want of it under water. Our lungs cannot act in water; the gills of the fish cannot act in air. They dry up, and cannot supply its blood with oxygen any longer; the delicate gill-plates stick together, become dry, and are useless. The fish dies from *suffocation* in air, just as we die from *suffocation* or drowning in water. Hold your breath for a while if you wish to know how sadly the fish must suffer when he cannot draw air through his gills.

Fish, such as crabs and lobsters, must be killed in a different way, and shrimps, prawns, and others which are cooked instantly on being caught, should be plunged at once into *quite boiling* water. This kills them in a moment. It is very barbarous to put any living thing into cold water and heat it gradually. Most salt water fish of this kind die at once on being plunged into fresh water, but to make sure, the water should be boiling. At many sea-side places huge caldrons are fitted up on the beach for this purpose, in sheds. It seems that fishes were intended to teach us much of the wisdom and goodness of the Creator; they are so often spoken of throughout the Bible. When Job is trying to make his friend understand the power of God, he bids him look to birds, beasts, and fishes as a proof of it. "Ask now the beasts, and they shall teach thee, and the fowls of the air, and they shall tell thee, *and the fishes of the sea shall declare unto thee.*" In all works wrought by the Creator's

hand, the most stupid observer cannot fail to notice *love* as well as power. It is shown by the way in which He cares for their lives and provides that their death shall in all cases be either quick and short, or else easy and gradual. Man should imitate this care of God; all good men do so; even when they are obliged to take life they take it mercifully—they never dare to displease or grieve God's Holy Spirit by inflicting needless pain.

One of our greatest English naturalists, one who made fishes his chief study, and who, forgetting himself, toiled all his life long for the good of man and the animals, did much to prevent cruelty to seals in the Greenland fisheries, where they were slaughtered in a most horrible way, in order that fine ladies might dress themselves in their skins. Since he and others have spoken about the vile and awful cruelty to seals, those who know it will no longer deck themselves out in what it is a disgrace to any woman to wear.

Also he prevented or tried to stop by making known much that was unmerciful in places where fish are landed in huge quantities; as in Grimsby.

This is how he speaks of the creatures he did so much to help:—

"Poor pretty, silent things!—yet endowed with the most sublime eloquence if only we have ears to hear! Fishes will whisper to us, and talk into our eyes, even if they do not speak louder—the lesson of humility."

Like a silver boat
With golden oars
I silently float
By the vast sea-shores;

Like a gleaming arrow
I haunt the river,
Or streamlet narrow
Where rushes quiver.

All quiet I poise,
  Like lightning I dart—
Not a trace of noise
  As the waters part;

No language have I
  But jewelled eyes,
No man when I die
  Ever hears my cries.

But God guards the deep,
  Its sons and its daughters;
His footsteps will keep
  His path, the deep waters.

Though no song I raise
  That man may hear,
My mute soft praise
  Can reach His ear.

## QUESTIONS.

Q. 1. What is that part of the air called which supports life?

A. Oxygen.

Q. 2. Do all living things breathe oxygen?

A. Yes. Without it, nothing can live.

Q. 3. Then fishes would die without oxygen?

A. Yes.

Q. 4. Is there plenty of oxygen in water?

A. Yes. When out-of-doors it is always being renewed.

Q. 5. How is it renewed in rivers, streams, and ponds?

A. By water-plants, which constantly breathe it out, and by the action of the sun, wind, and rain.

Q. 6. Then if you try to keep fishes indoors, must they not suffer?

A. Yes. However much we may try, we cannot make the water in tanks and globes indoors what it ought to be.

Q. 7. How are fishes covered or clothed?

A. With scales, thin, light, and waterproof.

Q. 8. Do fishes sleep?

A. It has not been proved that they sleep, but they require rest.

Q. 9. What sort of eye has the fish?

A. An eye without any lid; so that it likes a dim light, such as it would have in water.

Q. 10. Then can it be comfortable in a glass globe?

A. No. The light must be very dazzling and distressing. Even in China, they do not keep them so cruelly.

Q. 11. When fish are taken from the water, what ought to be done?

A. They should be killed instantly by a sharp blow on the back of the head.

Q. 12. Are fish useful creatures?

A. Yes. They cleanse the waters; keeping each other in check by preying on one another.

# Frogs, Toads, and Newts.

"A frog leaps out from bordering grass,
Startling the timid as they pass,
Do you observe him, and endeavour
To take the intruder into favour,
Learning from him to find a reason
For a light heart in a dull season."

—*Wordsworth.*

FLOATING on the top of almost any pond or ditch, during the months of March and April, may be seen a quantity of yellowish-looking jelly; which is nothing else but the eggs of the frog and toad who have left them there to be hatched by the first warm rays of the sun. As soon as the hot beams of May fall on these, and the nights grow less cold, black specks begin to appear in the middle of the lumps of jelly; they move, they gradually disentangle themselves from the clinging stuff, growing larger as they do so, till they wriggle away into the water, and start in life as tadpoles. And a very merry time of it they seem to have, for they are never still!—always the same active, gay, lively, little fellows, with big heads, wagging tails, and an air of huge enjoyment, as they go hunting from one end of the pond to the other, feasting all the while.

At first, the little tadpole has two short feathery branches coming out from each side of his head; by these he breathes; they are his lungs or gills. For the first few weeks of his life he is a vegetable feeder, clearing the stagnant water in which he lives from thousands of floating

specks of weed, too small to be seen without a glass, but which tinge pond-water green, and would in time choke it up, and make it unfit for animals to drink, as well as for fish and other living things to dwell in. Or else he falls to the bottom and busies himself in sucking up quantities of soft, decaying leaves, which are becoming rotten there, and spoiling the water. Sometimes you may see the bottom and sides of a horse-pond quite black with the millions of these little creatures, which are steadily and silently at their work; happy at the same time that they are useful. Were it not for them, and for other scavenging creatures of the same habits, the evil smells from pools, ditches, and marshes, would make the country most unwholesome.

After a few weeks of vegetable diet, the tadpoles alter: their outside gills disappear, and they breathe through others within their bodies; or, as some say, swallow air through the throat. They then begin to feed on animal food, dead or living. At this time of the year, about June, the eggs of flies and a multitude of minute living things are brought to life in the water; the heat of the sun causing it to be alive with myriads of specks, each with power of movement; the tadpoles do immense service by helping to clear the water, as swallows do the air, of the thousands upon thousands of tiny creatures which would otherwise thicken it with their living bodies, or pollute it with their dead ones.

The tadpoles move briskly about their business, pausing only now and then for a rest. They grow very fast all the while, till at length another change comes. Two hind legs begin to sprout, next two front ones; the front with four little webbed toes, the hind with five each. The tail grows shorter and shorter by degrees, till at last it is absorbed into

the body, and vanishes. Then, one fine day, out of the water creeps a little frog or toad as the case may be; a tiny bright-eyed fresh-skinned creature; small, yet though no larger than one's little finger-nail, quite perfect, and ready to go on with the same task on dry land that it has been working at in the pond; it will now help in cleansing the air and earth instead of the water.

The only difference between a frog and a toad tadpole is that the future frog is brownish black all over, but the tadpoles which will turn to toads are covered with very small glittering dots, as if they had been sprinkled with gold dust out of a pepper-box.

Although they are so nearly alike when they first creep up the bank, and sit side by side, so light and small that each will hardly bend by its weight the grass blade or rush upon which it perches, the frog and the toad will henceforth part company and lead somewhat different lives; they are not so much alike in their habits as in their looks. In the first place the toad will grow, if he has any luck, to be perhaps half-a-dozen times as large as the finest frog; and he will choose a very different place to live in. Frogs will never be found at a great distance from water, or in other than moist places. They feel very uncomfortable, and will soon die if their skin dries up. In very hot seasons frogs may often be found on the dusty roads quite withered, dead, and parched up. The reason of this is that his pond or ditch has been dried by the sun, and poor froggie has been forced to go on his travels to find a damp place,—he has died by the way! What a shame, what a cowardly deed, ever to throw a stone at, or hurt, a creature already in trouble! A kind boy or girl, one worthy to be called a Christian, would help to save the life of the little thing

instead, by lifting it into some cool ditch, or carrying it to some river's brink, if one is to be found, wrapped in a green leaf or a handkerchief, for the hot hand is painful to it.

The frog's skin is to him like a thick coating of blotting-paper; it is able to hold a good deal of moisture for a long while, but not for always. So the frog seeks for places where he may moisten his skin as often as he likes, though he will not *live* in water, because he breathes air. He is a graceful, light, pretty little animal, and exquisitely formed for the life he has to lead; his long leaps save him from resting too long on the ground, which in hot weather would dry his skin. He can pass over it almost as well as if he had wings, by means of those wonderful hind legs, which he first doubles up and then unfolds with a jerk, like some clever spring, which sends him flying through the air.

His manner of catching insects, on which he chiefly lives, is most amusing and shrewd. So soon as the frog, hiding in the grass or behind a leaf, sees a fly, small beetle, or caterpillar near, he suddenly turns his head and fixes his brilliant eyes upon it,—remaining perfectly still—much as a dog does when he "points" at game. He sits thus for an instant as if to make quite sure of his aim—then—all in one instant there is a spring;—a dart so quick that the eye cannot follow it—you only see that the fly is gone, and that froggie is swallowing something.

Sometimes he will aim at a fly and miss it, and then he comes down looking much discomfited, but as a rule he succeeds.

After the meal he sits motionless, looking very wise and thoughtful, but at the end of a short time, after making some dreadful faces and opening his mouth from ear to ear as one may say, he spits out the fly's wings, his legs, and all the

parts of him which are not nice, much as an owl does after eating a mouse. Then he will go to hunt for more.

Both the frog and the toad are without regular teeth, but have a number of prickles set in the upper jaw and in the roof of the mouth which help them to eat; but they cannot *bite*, because they have nothing in the lower jaw to meet the gristly points in the upper. They have no ribs.

The toad is more heavy and slow in his movements than the frog; his great beauty is his wonderful pair of eyes. These are so bright that people may well say that he wears "a jewel in his head"—indeed he wears two! His coat is beautifully marked, with a pattern not unlike that on the back of a tabby cat; and these markings vary according to the weather and the place he lives in.

Both frogs and toads change their skins as they grow too tight; that of the frog comes off in little bits, and is not noticed, but the toad takes off his jacket something after the fashion of an old gentleman,—slowly getting out of it, rolling it up under one arm, till at last he packs it into the shape of a small bundle, and finishes by doing what no one ever saw any old gentleman do—swallowing his clothes!

The old coat splits down the toad's back, showing a handsome bright new one underneath; and it does not take him much trouble to get rid of coat number one, while, fortunate creature! he finds coat number two all ready underneath, and has no tailor's bill to pay.

The toad is able to live in dryer places than the frog; because beneath his skin he has a quantity of cells, or little bags filled with a mixture which keeps him moist. This liquid is a weapon given to the poor toad for a means of defence, as he can neither run away quickly, nor bite, nor fight for himself. It is very acrid, or burning to the taste;

and no dog will take a toad into his mouth because of this. If you were to handle a toad while you happened to have a cut or a scratch on your hand, and some of the toad's liquid were to get into it, the place might smart and feel very sore. Behind each eye of the toad a larger bag of this fluid is placed, which if it should accidentally be pressed, would send out quite a squirt of this stuff, and if it got into your eyes it would make them burn and water terribly. It is put there no doubt to protect the eyes of the toad, and would never get into those of any person if he did not meddle with the creature. His little feeble means of defence was not meant to shield the toad from strong and wise creatures like men and boys—but merely to help him when attacked by other toads, or weaker animals than man. Nothing can save the helpless toad from a cruel stone thrown by a merciless boy; God trusted these frail animals to us without making them fierce or poisonous that we might be kind to them. Let us think of this, and it will make us careful never to persecute anything which the Heavenly Father made weak in order that we might show courage in defending it. It is from the fact that the toad carries this fluid in his skin that so many silly stories have arisen about him; foolish people have fancied that he was able to shoot fire out of his mouth and eyes, that he was poisonous and hurtful, and have invented all sorts of absurd falsehoods about him. Do not you listen to a word of it. The best way is to leave the gentle, harmless toad alone, and he will leave you alone; and if you do not pull him about or tease him, he will be glad to live peacefully near you.

His way of feeding is not quite like that of the frog. He makes no bounce on his prey, but creeps cautiously near it, and then darts out a wonderful tongue, sticky at the tip,

which he keeps folded up in his mouth, the root towards his lips and the point towards his throat, so that it springs out easily to a long distance when he opens his jaws. With this instrument he catches all kinds of creeping things which happen to be within his reach, sometimes quite large ones and sometimes those too small for us to see. He will live in gardens of his own choice sometimes, and when he does so, he is worth anything to the gardener, for his priceless service in eating slugs, snails, moths, caterpillars, ants, blights, earwigs, beetles, and a host of other foes—insects which it is necessary in a garden to keep within bounds.

Many people have made out-door pets of toads; these creatures are both clever and curious; perhaps more intelligent than frogs, though these too make capital friends, and will soon learn to come when called, hop close to those who feed them, and even follow them from place to place.

A toad used to come to a gentleman's window at dinner-time for his share of the meal, and was always punctual. For some reason the dinner hour was changed from four to two o'clock; and as there was no way of letting the queer guest in the garden know of the alteration, the toad missed his dinner. But only once! After a single day's fast he reappeared;—he must have kept a careful look-out; and ever after he was in his right place at the window sill without any watch or clock to help him. Animals have a strange power of measuring time; most likely they are able to do it by the sun, the position of whose rays they feel more keenly than we do—knowing whereabouts in the sky he is even when behind clouds.

In winter, frogs and toads creep away into holes and corners, or bury themselves in mud. Sometimes a poor

toad has been found to have crept, when very small, into a hole, and has stayed there until too big to get out again at the narrow opening. Then, many years afterwards, masons or quarreymen have found him there, and people have fancied that the toad could live for hundreds of years without food. This idea has been proved—I am afraid by some very cruel experiments which would have been better left unmade—to be quite a mistake. Toads shut up in such places must always have had some small crack or opening into their prison-chamber through which small insects could crawl for them to catch, and water trickle for them to drink.

Though creatures like frogs and toads can live for a long while on very little food, they can no more live altogether without it than you or I can. It is a great pity that people take up such false fancies, and also that they will keep creatures without understanding how they ought to be fed. A very common habit is to keep tortoises—imagining that they will eat black beetles, as the men say who sell them in the streets. Many of the tortoises sold in this way to ignorant people are *water-tortoises;* especially a small dark sort with a tail.

It is selfish and cruel to keep creatures and let them die by inches of starvation, simply because it is amusing to watch something you have never seen before. You who wish to be good do not eat your own meals while you are, for pleasure, letting a helpless creature suffer hunger and want, though it may be only a tortoise. Never buy any creature unless you understand its habits, or merely because a salesman tries to deceive you that he may sell his living goods. He only wants to make money, and you are encouraging him in a bad, idle, cruel trade when you buy

captive wild creatures, either English or foreign. You are urging men on to procure more, and cause new misery.

There is a third kind of tadpole to be found in stagnant ponds; a slender little thing, with a transparent-looking, tapering, silvery body. This is the young of the pretty little water-newt, eft or triton. The mother does not lay masses of eggs to float on the tops of ponds, but single ones, which she wraps up carefully, each by itself, in the leaf of some growing water-weed, to prevent it from sinking or being washed away, as well as to hide it. She uses her little fore-feet, which are very much like tiny hands, for this work. Newt tadpoles look very much like little fishes at a first glance; but they have outside gills when first hatched, as other tadpoles have, and afterwards legs. Their tails remain long always, and are very slim, elegant, and delicate. The little newt is not unlike a tiny crocodile, but soft and smooth. It is perfectly harmless, and is more like a frog in nature than like a lizard—the crocodile is nothing but a big lizard. Its work in life is to cleanse the water in which it spends the greater part of its time, liking to creep out on to dry land sometimes. In spring the male newt has a fine scarlet or orange throat, and wears a red-tipped frill all down his back. He may then be seen at the bottom of any clear pool walking side by side with his little wife, who is not quite so smart; or clinging firmly and tightly to the stem of some water-plant, which he grasps with his hand-like feet.

It is very unkind to take the newt from his happy water life; he is wretched when kept in confinement. You cannot possibly give him what he wants in any bottle or basin, or pan or aquarium, of any kind. He likes society, and to choose it himself; he wants proper food, with the exercise

and pleasure of hunting for it; he requires plenty of water-room to move about in, and to be able to take a walk ashore when he feels inclined. He feeds on the larvæ or young of beetles; flies, gnats, dragon-flies, and many other water creatures, and it is doing mischief to take him from his useful labour and make him unhappy into the bargain.

The number of flies would increase dangerously in many places, and render our air unfit to breathe, and our ponds unfit for use, were it not for the services of the toad, the frog, and the newt, both in the water and out of it. They do equally useful work in the water-world and on dry land; and they are entitled to every protection at our hands, as well as to their freedom.

It is disgraceful, almost blasphemous, to call these creatures of God "ugly" or useless. They are the work of His hands—and, coming from the Author of all Beauty, must have a fairness of their own, were our eyes not too blinded by ignorance and sin to see it. Who is the best judge of beauty,—the great Creator, or sinful, fallen man? Be sure that God made nothing *ugly*—any more than He made aught *useless*.

God knows better than I can know,
  Sees farther than I can see;
If he has made any creature so,
  Just so it ought to be.

I may not say of His perfect work,
  It is ugly and useless quite;
Better to say of my sinful self,
"I am blind, Lord, give me sight!"

Sight to see truly, a tender heart
  Instead of a cold, hard stone;
And grace to hold dear Thy handiwork,
  Out of love to Thee alone.

## QUESTIONS.

Q 1. How do frogs and toads begin life?

A. As tadpoles.

Q. 2. What is the difference between a frog and a toad tadpole?

A. The tadpole of the frog is dark all over, while that of the toad is sprinkled with little specks like gold.

Q. 3. What other kind of tadpole is found in ponds?

A. That of the newt.

Q. 4. Of what use are tadpoles?

A. They clear stagnant water, making it clean and pure.

Q. 5. How do they clear it?

A. By feeding on vegetable and animal matter which would putrify and make the water unfit to drink and bad to smell.

Q. 6. After the tadpoles have turned into frogs, how do they live?

A. The frog lives in moist places, unlike the toad, which can live in drier spots. Both eat insects.

Q. 7. How is it that the frog must live in moister places than the toad?

A. The toad has little bags of liquid beneath his skin which keep it moist, but the frog has only a thick skin which holds water, as blotting paper does, for a short time.

Q. 8. Of what use is his liquid to the toad besides making him able to bear heat and dryness?

A. It is a defence to him, because dogs and many other creatures, disliking the burning, acrid taste, will not touch him.

Q. 9. Can the toad bite or poison people?

A. No, he cannot bite, for he has no teeth, and he has no poison about him.

Q. 10. Why is it cruel to keep the little eft or water-newt in captivity?

A. Because we cannot give it right food, enough space, company, or power to walk on dry land when it chooses.

Q. 11. Why is it cruel to buy living creatures, either foreign or English, which have been caught for sale?

A. Because it encourages a bad trade, and those who sell them will procure more.

Q. 12. Why should we not buy tortoises on the street?

A. Because we may not know how they ought to be fed. Many of them are water creatures, and must die slowly on land. It is best to have nothing to do with any wild creature, unless we know its habits.

# Birds.

## I.

"These birds have joyful thoughts! think you they sing
Like poets from the vanity of song,
Or have they any sense of what they sing?
And would they praise the Heaven for what they have?
And I made answer, 'Were there nothing else
For which to praise the Heaven but only Love;
That only Love were cause enough for praise.'"

—*Tennyson.*

All birds, great and small, from the giant ostrich to the fairy humming-bird, are born into the world within the most wonderful cradle.

The cradle of the bird is the egg. Inside it is neatly packed away not only the beginning of the future living chick, but a store of food for it to eat, and even some air for it to breathe so soon as it is able, and before it has strength to break the shell and come out.

Take a common hen's egg into your hand and look at it well. All eggs are made on the same plan, and if you understand one, you understand all. First notice its shape; it is not square or flat, but curved and rounded on every side. That is to make it strong. Bridges over which great weights must be carried are generally held up by arches; this arched or rounded shape is the strongest of all, and the egg is thus formed in order that it may bear the weight of the mother bird when she sits upon it, without having too

thick a shell. If the egg were strengthened by a strong shell, the young bird could not crack it; so the egg is made in such a way as to combine strength and thinness of shell, so that the little prisoner within can burst through when the time comes, yet is not in any danger that the walls of his cell shall be crushed before the right moment.

If you break the egg into a cup and then notice the shell, you will see that it is lined most carefully with two coats of thin stuff, not unlike fine waterproof cloth. These linings may be peeled off, and then the egg-shell only is left, which is *porous*—or full of holes too small to be seen. Why is the egg-shell made porous? That a very little light and air may pass through it to the chick inside—not too much. And why is it so carefully lined with waterproof tissue? To prevent the liquid of the egg from oozing out.

Now look at the contents of the egg-shell which dropped into the cup. It seems at first sight nothing but a yellow ball floating in some clear slime; but if you examine it closely you will find much more to observe than that.

At the top of the yellow ball or yolk is a small, round, whitish speck, and from that speck you may see a quantity of white filmy-looking threads branching out, which come from it in all directions and generally collect into two bunches, one on each side of the yolk, and float like a couple of small clouds in the white of the egg.

Now in whatever position you hold the egg, that little white speck will always keep uppermost, and it is kept so by the white bunches of threads. They are collected together *underneath* the yolk rather than at the sides, and make that lower half of the yolk to which they are joined heavier than the upper side where the speck is, so that by their weight, slight as it is, they keep the speck always uppermost, pull-

ing their own half downwards. If you chip a small hole carefully in the side of a hen's egg so as to be able to look in without letting out the yolk and white, you will notice that, turn the egg in your hand how you may, those weights always keep underneath and swing the speck upwards, so exquisitely are they balanced.

The reason for this beautiful plan is that in the small speck is the *germ* or beginning of life; it is the part from which the chick will begin to grow. It is needful that this part should be always kept next to the mother's breast, to receive the greatest warmth. So if the eggs in a nest should be accidentally put out of place, or turned round, or upside down, it does not matter; the machinery inside the shell acts, and the proper part is again brought upwards, against the feathers, close to the body of the sitting bird.

In time this speck begins to spread and grow; the heart of the chick is formed; by degrees its wings, its lungs, and its head and beak follow, while the patient little nurse is sitting on the cradle outside. What a delightful cradle! it is not only the baby's sheltering bed, but its storehouse as well, with nothing forgotten—not even a supply of air. At the larger end of the egg there is always a small space filled with it. You may find out this by placing the large end against your tongue; if it feels hot very quickly, that is a sign that it contains air, because a solid or liquid would take far longer in heating. In that way people can tell whether an egg is new-laid or not, for the chick does not breathe this air away till it is of a good size.

Whilst it is forming, before it is full grown, it has a plan of breathing through the egg-shell; but when its lungs are fully made, it uses the air at the end of the shell instead. When that is all gone, the chick fills the whole

shell, and is big and strong enough to chip it and come out.

He has a little knob on the top of his beak for doing this with, which drops off afterwards; and it is supposed that he bruises the shell by pressing this knob against it rather than hammering or chipping at it, turning round inside and breaking the shell in a circle as he goes, until a piece comes off quite neatly, much as the top of an egg is taken off at breakfast-time.

The chick gives a little cry when ready to come out, which is said to be a signal to the mother to help it: it is likely that wild birds *do* help their young to chip the shell; yet some people have thought that they do not, because the little chick seems quite able to do it all for himself. So soon as the top bit of the egg-shell lies loose, like the lid of a box, upon the lower half, the chick sets to work with its claws, which are doubled up so as to lie under its beak. With these he somehow contrives to scratch the upper piece of egg-shell down, and to turn it gradually inside the other half of the shell, getting his body upon it by degrees, much as if a spoon were put into the egg-shell to help him out. Thus he is scooped or hoisted into the light of day, ready to begin life. Almost all empty eggs of wild birds are found with the upper shell turned inside the lower; no one could tell how this was done, or why, until a partridge chick was watched coming out of the lower shell and using the upper half to give it a sort of lift. This helps us to understand why an egg should be *oval* and not quite round.

When the young bird grows too big for its egg-cradle and leaves it thus, it finds itself within another bed; the soft warm nest, so snugly made by its loving parents, who are

ready and waiting to brood over its helplessness, for, of course, it is not able to take care of itself.

Birds do not all sit on their eggs for the same length of time. The goose, and others, take a whole month to hatch their broods, while some of the little hedge-birds are only ten days on the nest. But whether it is for a short time or a long one, the parents are most true and faithful, the mother to her chicks, the mates to each other. Sometimes the father bird takes his turn at sitting to give the mother a rest; but all kinds have not this custom.

Think of the long, patient watch! and of all the care and thought which the little creatures take for their young!—For it *is* thought. The mother, if she leaves her eggs for a short time when it is needful for her to feed, and to stretch her cramped legs and wings, does not forget her home and its duties. Never! She remembers the eggs all the while she is away, for it has been observed that on a cold day she will go back sooner than on a warm one, for fear the eggs should be chilled. Her going and coming is not a mere accident. Birds *think*, too, about how to build their nests—they will not use any scrap that is brightly coloured if the nest is to be in a place where it might show, and where any gaudy bit might draw attention to the little dwelling; but they will use things of the kind when the nest is well hidden. I was once on my way into the house from the garden, and dropped a skein of brilliant scarlet wool: missing it at once, I turned back to look for it. I was not away for two minutes from the place where I knew I must have lost it, yet when I came to search, the wool was nowhere to be seen, which puzzled me, because being of so bright a colour it would easily have been noticed if there.

It was not until months afterwards that I found my

skein; and then one autumn day when we knew that all the birds had reared their broods long ago, my brothers and I went round the garden nest-hunting—for in those days we liked to collect the nests when the careful little parents had done with them. We found the nests of several chaffinches—all carefully built out of lichen, or moss, or whatever bits and scraps would closely match the trees in which they were made, so as to escape prying eyes; but *one* chaffinch had made her nest in an old twisted ivy tree which grew over a wall with railings at the top, and as the nest was completely hidden in the branches and buried under protecting broad, green leaves, she had ventured on a scarlet lining. There was my skein carefully woven round and round almost as neatly as if the mother-chaffinch had borrowed my needle as well as my wool. The bright-eyed little pilferer must have snatched up the skein almost before my back was turned to make a blanket for her babies with.

Thus these thoughtful housekeepers not only take care for their household at the time when they have families to provide for, but long beforehand. What a shame that anyone should rob them of what they have spent such pains and toil and so much wisdom in making: or should ever shut them up in cages away from the little mates and tender broods for which they are able to show such wonderful love! How terrible solitary confinement must be to a little bird, made by God to be joyous and free! We think it the worst punishment that can be inflicted on a *man;* and there are many who would die rather than bear it. What must it be to a creature with wings? Nobody who would dislike life in a jail for themselves should condemn a creature to pine

in prison merely because it is smaller and weaker than themselves—especially not a bird, which must be in misery greater than we can tell if put into a cage. No one should rob a nest unless he would like to have his own home torn away from him.

Foreign birds, like parrots and parrakeets, have more to suffer even than English wild birds when caged, because they are brought from warm climates, and cannot bear the cold without great wretchedness. It should be remembered that all birds are wild somewhere. Those who have seen the lovely white cockatoos coming down in snowy flocks on the Australian fields, as rooks do in England, could not bear to see them chained to perches or cooped up in wire prisons without their natural food or warm, sunny, free life. If people would cease to buy these poor creatures, traders would leave off catching them and bringing them home to pine in dreary bird shops, or languish away from disease in gilded cages. It is to be feared that the keeping of birds in cages is encouraged by tradesmen who wish to make money by selling food for the little captives as well as cages to keep them in. Merchants offer prizes at wild-bird shows for this reason, and try to tempt people to do cruel things in order that they themselves may grow rich. Thus packets of food for larks, thrushes, and blackbirds are sold, and the idea of catching them is put into people's heads. It is a pity that these men do not find some better trade. Even the birds born in cages, like the canary, are the means of bringing about much torture. For every canary well kept, a dozen are neglected, and become masses of disease, covered with ulcers and parasites, a wretched sight to behold. The example is a bad one to set, even where these birds are properly treated. And can a bird—a

winged thing—be *properly treated* in a cage? What a birth-place for a creature which God made to fly above the earth in the open firmament of Heaven! Can He be pleased to look down and see *any bird in a cage?* Besides the chaffinch, a young married couple, a thrush and his wife, showed real care and prudence about their nest in our garden. It must have been their first attempt at house-keeping, or they would not have been so unwise as they were to begin with. They did a rash thing from inexperience—found out their mistake and corrected it. A laurel bush just outside the kitchen-door was the spot this pair chose; but beneath the shrub was an old dog-kennel, which, being empty, was sometimes used by the cat when she wished for a nap in a sunny, cozy place.

When I saw the nest finished and ready for the eggs I felt sorry, for I was sure that pussy, from her larking-place, would find out the nestablishment of Mr. and Mrs. Thrush, and disturb the young brood. The father and mother seemed rather anxious too, for they were to be heard chattering together, in a somewhat unquiet way, early in the mornings, as if they did not quite like the look of things at home. One day, as I passed by, I noticed that instead of a tidy nest in the crook of the branch, nothing but a ragged mess was there—only a few bits of stick, a straggling end of moss, and the round cup-like mud lining. It was all a wreck!—was pussy to blame—or who could have been so wicked and cruel as to beat down the pretty dwelling?

Certainly it was impossible to help suspecting the cat;—still I did not see why she should attack an empty nest! And presently I found out the mystery. The thrush and his mate were busily flying to and fro—they had found their home far too near the kitchen door, and pussy's sleep-

ing place, and so they had settled to move house: were now, indeed, in the very act of moving. They had broken up the nest themselves, and were carrying the materials bit by bit to a famous corner in the kitchen garden where a little cherry tree grew against a sheltered wall, well out of the way of cats. It was a true "moving"—unlike that of human folk, who, when they say they are going to "move house," mean that the house is the only thing they are *not* going to move. These wise little people had "laid their heads together," and consented to be economical, and use the same sticks, grass, mosses, or scraps—instead of wasting time and trouble in going farther afield to collect new furniture. Thus the loving pair foresaw risk to their children, and took steps to guard them from harm even before their young were born. The thrushes reared their brood safely in the new abode.

So soon as the tender task of rearing is over, the nestling finds himself all ready for bird life, dressed in an outfit exactly suited to his wants. The bird begins his life in the air fitted for it as carefully and exactly as a fish is formed for the stream, or a mole for burrowing underground: and if people would only see it, it is nearly as cruel to take a bird from its proper place as it would be to take a fish from the water out of mere idle fancy. The only difference is that the fish will die—it would be happy, perhaps, for the caged wild bird if he, too, could die when robbed of his airy life.

A bird's bones, his clothing, his legs, his beak, his whole body as well as his wings, are created on purpose for either flying, resting on trees, sleeping on the same, or finding food in the places where he is intended to live.

The bones of birds are quite different from those of any

other creatures; they are not solid or filled with marrow, but hollow or else full of cells into which the bird can force air from his lungs. All his bones are full of air; he can breathe all over him so to speak. This is to make him light: in small birds the bones are hardly thicker than strong quills, but very tough.

For this reason it is very cruel to shut up birds in close rooms; the air which human beings often manage to breathe must be misery to them. They want constant fresh air to keep them in health, and they get many diseases for want of it. Fresh air cannot be given them in houses without draught, which gives them cold.

Then the clothing of a bird is most perfect; the feathers which cover those beautiful fans or wings with which it beats the air so as to move along through it,—which it can do at from 30 to 120 miles an hour; the swift darting more quickly than any other, and reaching the higher of the two rates named, while most of the little birds commonly seen in the fields seldom fly more slowly than the lower number. This dress of feathers is a wonder of fair and careful workmanship. The feathers which are set in the wings and used in flying are very stiff and strong; they have a flat blade, their fibres are closely hooked together, and they are marvellously light. The largest quill of a golden eagle weighs only 65 grains, seven of such quills do not weigh more than a penny piece. All the feathers of a common fowl weigh about 3 ounces only; and the whole plumage of an owl weighs but one ounce and a half. The feathers which clothe the wing have a shaft or middle rib from which branches go out to right and left, much as a fern-leaf is made: each branch having another set of smaller ones up each side of it, which are tightly locked together by

means of little hooked ends, to prevent the feather blade from splitting and letting the air come through, for the use of the wing is to *beat against* the air, not to let the air pass through it. But the feathers which cover the rest of the body are made quite differently. They are loose and downy, being intended for warmth only. The bird keeps a sort of oil with which it dresses its plumage to keep out rain and damp; or else it is plain that the first shower would soak it through, as water does a dead one.

The tail is used in flying somewhat after the fashion of a boat's rudder; to steer the bird through the air; also some birds use it to steady themselves when they perch, as the woodpecker, the swallow, and others.

If a bird cannot use its wings it must sooner or later become ill. God gave it wings *to fly with;* nothing can ever right the wrong of shutting it up. However well a caged bird may be treated, it is still being prevented from doing what God meant it to do. He made birds to fly; man has no right to prevent them from flying so long as they do him no harm—and that they seldom do—while *good* they are far more often doing, if he would but see it. It is a very poor and wretched excuse to say that keeping birds in cages "brightens the lives of people." If we feel pleasure in what makes an innocent creature suffer, we ought to be ashamed of that pleasure; we should be more good, *more happy in the end* without it.

Those birds which perch on trees have a muscle which, of its own accord, clasps the twig. This muscle may be noticed in the foot of the common fowl. When a cock or hen walks, in lifting its foot from the ground the claws clench themselves naturally; it is an effort to the bird to spread them out flat again, not to contract or draw them

together. This makes it easy for birds to stand or even to sleep on twigs, because the claws grasp the bough without any fatigue on the part of the bird. The feet and legs of birds are altered according to their habits. Those which wade in water have long legs like stilts, to keep their bodies high and dry; those which seldom perch, like the swift, have very short legs; swimming birds have webbed feet to use as oars or paddles; the lark which roosts on the ground has a strong heel or spur, which prevents his foot from growing tired, and helps him to rise. Most birds have their claws arranged so as to have three in front and one behind; but parrots and some other climbers which want a strong and firm grasp of the bough have a pair of claws on each side: two in front and two behind.

When a bird, such as a robin or sparrow, rests on a twig, it doubles up its leg into a shape something like the letter Z. The upper joint of the leg, or thigh, is usually hidden among the feathers, but the middle of the leg may be seen plainly, like the middle bar of the Z, and the third joint slopes something like that bottom part of the letter; the claws at the end of it clasping the branch. The weight of the bird, as it rests on the top of this zig-zag leg, makes the muscle in the foot clasp the twig; and he balances his body more truly by putting his head back over his shoulder, beneath the wing.

When caged birds suffer more from diseases of the feet than in any other way, perhaps this is because the small, smooth, round perches fixed across their cages are not at all what they want. Their feet were made to stand on rough, slanting branches of trees, and they like to choose the right thickness for themselves, and to change the twig when the foot is tired. A poor caged bird hops from one uncom-

fortable (often dirty) perch to another, and then the people who have shut it up say, "See how brisk and merry he is!" But the truth is that the little thing is restless; quite as uneasy as you would be if with your flat sole you were obliged to stand or step always upon a round, smooth, slippery pole.

But of all the parts of a bird which we must admire, perhaps the beak is the most wonderful. It seems to be a fly-trap, a pair of scissors, a needle and thread, nut-crackers, a spoon, a spade, a shovel, a hammer, an axe—anything and everything all in one to the fortunate creature which owns it.

And this busy, clever beak is at work always—not for the bird only, but for man, too. God sent these bright creatures into the earth to be happy, but to be useful too, if man will only let them do their work in peace, instead of taking their eggs, and frightening and killing them all out of the world. They were not made by God to be shot for pleasure,—how can anyone find delight in seeing a fluttering, gay, innocent thing suffer and die? They were not created for trimming bonnets and hats;—how can people like to have the remains of their poor little dead bodies, after they have been killed with great barbarity most likely, stuck on to their clothes? or like to make their heads into a sort of grave-yard for small birds? Neither did the Heavenly Father form them for amusing folk who shut them up in cages, where they sing, it is true, but only because they have no other way of making their sorrows known. People fancy these songs, which tell of a captive's longings for the green woods, to be gay! but the warble of a caged bird—to anyone who is not hard-hearted—is the saddest sound almost that can be heard; because it speaks of man's selfish-

ness and tyranny over God's works. Birds were created first for the glory of God, so we should not dare to torture them; secondly, for our delight and service, so for our own sake, if not for God's, we ought to love and protect them. Without birds it would be impossible for man to live on the earth at all—let us think why.

We know that in order to live we must have air to breathe, food to eat and water to drink. And the air which we breathe must be clear; that is, if it were choked up by thousands of small flying insects or floating spiders' webs we could not draw it into our lungs; it would choke us.

As to the food we eat, corn, we know, makes bread, "the staff of life." Nothing is more likely to be attacked and spoilt by grubs and insects of different sorts than wheat. There is a fly called the "Hessian-fly," which destroys corn by the acre in America; and in England we have the "wheat-fly," which lays its eggs in the early green corn where the grubs turn into flies after eating the ears, and then lay eggs. If anything happened to the grass we should have no food for cattle and sheep; and grass has thousands of insect enemies; the cockchafer grub, the wireworm, grasshoppers, and numberless tiny caterpillars.

There is no kind of vegetable which has not its special grub or fly; the cabbage is devoured by the green caterpillar. The turnip, potatoe, marigold—each and all are attacked by various tiny foes too small for the farmer to fight with, because he cannot see them. They are too many for him, and too minute. Peas and beans, apples and pears,—all fruits—every good thing which grows is infested in the same way. The small grubs which destroy them are nearly all flies, moths, or beetles, at one time of their life—before they lay more eggs—and in this stage,

when they are likely to do future mischief, birds eat them by millions, as well as searching for and finding them in the egg, caterpillar and chrysalis state. If it were not for this friendly office of the birds we should in a few years not have a green thing left.

As to the water,—that would be in a sad plight if all the insects which lay eggs in it were allowed to multiply; for soon it would become quite thick with living things; or putrid from dead ones.

We should be in a bad way indeed if the birds were all gone!—our food devoured by swarms of creatures too small and too many for us to catch—our water unfit to drink—and the air choked up by flying clouds of flies.

It was to prevent this dreadful state of things that the many tribes of small insect-eating birds were created. They clear the crops of grubs and eggs of insects, besides eating the seeds of weeds, for most of them eat two kinds of food.

Without them the earth would soon be a wilderness and everything must die.

Certain tribes of birds keep the air clear of the millions of small winged insects, which if unchecked, would soon make it unfit to breathe, as well as of tiny spiders which spin gossamer webs. The greater part, or at least half of these flies, lay their eggs in water, so that their young, living in it for the first part of their lives, would make that useless and unwholesome, too, if their numbers were not thinned. Swallows are the most useful of birds by way of clearing the air of those flies which fill the air, and would also overcrowd the water with their offspring if let alone. These pretty creatures may be seen skimming over ponds and rivers at their useful work—just as the gnats and water-flies are settling on the surface to lay their eggs, or rising from it in

their perfect state. A swift's mouth was once found to contain as many small flies and beetles as would fill the bowl of a table-spoon.

But these birds, swallows, swifts and their tribe, seldom perch on the ground. It is to sparrows, robins, wrens, tits, fly-catchers and all the finches that we owe a vast debt for keeping our fields and gardens free of caterpillars and weeds to a great extent. All these birds feed their young on insects and caterpillars—as well as often eating them themselves; with their keen eyes and sharp beaks they catch sight of what we should look for in vain.

There has been only one weapon ever formed which can help us in our war against the armies of small creeping or flying things; and not only against these but against the myriads of floating seeds which would soon smother up the useful plants.

It has been reckoned that the seeds of one kind of thistle alone, but for the birds, would be enough to stifle all the other growing things in the world before long! Besides thistles, there are a hundred sorts of weeds more harmful still; groundsel, chickweed, plantain, and many more—all favourite food of birds.

The only weapon which can help us to fight against all these difficulties is—a gun and a trap? No; the beak of a bird.

Let the farmer leave the rooks alone; they will soon clear his grass and ploughed land from underground grubs —the jackdaws and starlings will help them; while the lark, hedge-sparrow, flycatcher, and a host of others, will eat those which live above ground.

The gardener should entice the tits, linnets, robins, wrens, chaffinches, thrushes, and blackbirds to come and breakfast

on his snails and slugs, green caterpillars, blights, and tiny crawling pests of all sorts. After the chaffinch has fed her young on green caterpillars, she will go and dine on groundsel or nettle seeds herself; and as for the hedge-sparrow, robin, wren, and most small birds, they eat insects all day long by choice and nothing else when they are to be had.

It has been proved that the house-sparrow kills 4000 grubs a day while it is feeding its nestlings, and throughout the summer nearly all birds of about his size are engaged in the same useful work.

Throughout the winter birds which do not eat berries (and many do not) have nothing to live on but the chrysalids of moths and flies, their eggs, which occasionally are found in winter, and grubs of beetles, all of which, if allowed to live, would in all likelihood bring about a famine during the following season. At that short time of the year when fruit and corn are ripe—only a few months—it is true that birds do some little damage as well; but it is said they eat fruit not for the sake of food so much as because they are thirsty—for birds often suffer much in hot weather as well as during frosts for lack of water. If pans of water be kept always filled in or near the fruit trees and bushes, they are said to visit the fruit less, and make the water do instead. It is a fact that tits, bullfinches, etc., will break off a bud or two when they are insect-hunting in spring. As a rule, when they pluck off a bud it is because their sharp eyes have found out an egg or grub at the core; that bud would never have come to much in any case with an insect gnawing it. The worm would have lived there; in time changed into some creature which laid eggs; these in their

turn when hatched would have done much damage to the tree. So the bird does much service by plucking off the blighted bud. But sometimes after a long winter birds will eat leaf-buds for the sake of a little change and for lack of green food. Well, after a whole winter spent in hunting out dangerous little moth-chrysalids and grubs for us, we ought not to grudge them a taste of our best. It is doubtful whether it does fruit-trees any harm so early in the year to lose a bud or two. It may indeed be all the better for the tree in the end, for a too early growth is sure to be checked with winds and frosts; the trees soon sprout again if the buds are not allowed to spread into leaves before they are nipped.

Mr. Wotherspoon, the great fruit-grower, has said that he finds *sparrows* his greatest friends. He coaxes them to live with him, making holes for their nests in his garden walls; but he covers up his fruit with nets in the ripe season. The rest of the year they do nothing but good. If the little birds do a bit of mischief now and then—only for a few weeks—we must recollect what they do for us *all the year round*—cleansing our air, our water, our ground. And in winter we ought to feed them when they cannot find food for themselves, and not rob them of all the berries out of the hedges, as is done near some large towns. God put them there for their food, and made them beautiful. But we can look at their pretty bright colour without taking them away. They look best where they are, and in our close houses soon shrivel up and spoil, and are no good to anybody.

The birds ought not to have a bad character given to them because we sometimes fancy that they do a little harm. Supposing that the glazier came to mend a broken

pane of glass, and that as he was mending the hole he broke a flower-pot in the window, should we say, "Oh, all glaziers are mischievous, useless people, we must get rid of them every one"? That would be very foolish; but it is just as silly to say, "Yesterday a bird snapped off a bud from my apple-tree; so all birds are bad for a garden and must be shot." Yet that is what many people say and do who think themselves most wise.

It is fortunate that quite everybody in England does not want to act thus; or else we should all be crying out for the birds to come back again, when it was too late, as they have been obliged to do in France and New Zealand and other countries where they got rid of them all, and then found the insects quite a plague.

Besides their usefulness, birds are the brightest, most cheerful, sweet, gay companions that we can have in our woods and fields, and without being so selfish and cruel as to make captives of them, we may still have them for friends.

In the winter, when food is scarce, birds are easily tamed, as well as in spring, when the parents are feeding their young, and are thankful for a little help towards feeding so many hungry mouths. They gladly pick up scraps thrown to them at that time, and will venture very close to houses and people for them. But the younger the bird, the more easily it is tamed. The little parents will learn to come to any window-sill for food, and in time the fluffy young ones will be brought, too, and these will show hardly any fear of you. An upper window should be chosen for fear of cats, and with patience anyone may have bird friends to pay them visits, to come and go, free, and giving their love freely.

Even in the crowded town there is always the lively, clever, pretty, comical house-sparrow; no one is more glad to know

you than he is. Teach him that you are glad to see him, and you will soon see his brown cap popping in at your window, fearlessly, as soon as he sees that you do not want to take his liberty away. He will hop in and out, as bold as you please, perhaps bolder; for he will steal your thread to line his nest with, and pull the feathers out of your pillows if he happens to get a chance.

Nothing pleases nesting sparrows better than a plateful of skins from baked or boiled potatoes. I have seen a mother sparrow collect a great plateful of food looking like a bunch of wool and carry it to her brood, coming again and again and finding more, although the skins looked to me perfectly bare.

The sparrows do much towards keeping the gutters, pavements and yards round houses clean and wholesome; they pick up morsels and scraps too small to be noticed by other eyes, which would, in time, breed illness. In winter there are no flies to do all this, but the sparrow, like the dustman or the chimney-sweep, is always ready for this work. He deserves his pay then as well as they do their shilling or eighteenpence.

In the country or in large gardens, young birds are very easily tamed; they do not seem to have the same fear of human beings that older birds feel.

I was once walking over a lonely down, and a mother wren was teaching about a dozen tiny wrens to fly from a fir-tree near by, and back again. I watched the wee things as they took short flights, while the mother, proud and fussy, seemed to be showing them how to do it.

All at once, without the least warning, one of the small downy balls, the bravest of the family I suppose, broke from the rest and came flying in a straight line towards me. I

stood quite still, and the birdie settled on my shoulder, to my great delight. It peered up in the oddest way into my face, as if to say, "Well! you are a queer-looking bush." And then it tumbled itself head over heels down my arm and sat on my wrist, which I raised up for it. It did not show the least fear, though its anxious mother was calling it back, with shrill piping cries, to come out of harm's way; and I daresay she was calling me names and telling all the other baby birdies never to go near such a thing, for I wasn't safe. I was so pleased to have this visit from the little birdling of its own accord that I think I could have stood there for hours rather than frighten it away, but at last I moved, and it seemed in a moment to hear all the fright in its mother's voice, and fluttered back to her and its brothers and sisters in a great hurry.

Of all birds a young robin is perhaps the most easily tamed in a garden. These little dicks seem to like human society, and will often follow a gardener, even perching upon his spade, to collect the worms and spider's eggs which it turns up.

A young robin was once brought in by our cat—pussy did not know how much we disliked her habit of catching birds. On the contrary, he was proud of doing it, and thought she had pleased us. When she caught a mouse she always took it into the kitchen; but if she caught a bird she always brought it into the drawing-room to show us; until we made her understand that we did not like to see it.

She let us take this young robin from her, for she was gentle and good; and the little bird flew away quite unhurt. Next day as I was cutting beans in the garden I noticed something rustling about near my feet, and thought

it was a frog or a mouse; but after a time I saw that it was the same young robin—he had a scrap of a white feather in one wing by which I knew him. He flitted close around me all the while that I was going up and down between the rows of beans, almost touching my head. "Here I am, you see, alive and well, safe from that dreadful tiger-pussy; thanks to you!" he seemed to say with his little, sharp, cheery chirp. For many days he hovered about me and round the front door and windows, coming down when whistled for, following our footsteps, and enjoying any treat scattered for it. It would perch on the back of a chair or even on my boot if I were sitting on the lawn. This went on till I suppose Bobby had a mate and family who wanted his attentions, as we did not see much of him again till autumn, when we left that place, and of course could not take Bobby with us.

It is sad to think that anyone can find pleasure in shooting, or robbing these sweet, happy creatures; we must hope that the time will come when such things will no longer be done among us. There was a time in England once when any man who saw another weaker and smaller than himself thought it quite fair to rob him, or to kill him if he pleased. All that is gone by now—the law prevents the strong from tyrannising over the weak. We must trust that soon everybody will learn how base, mean, and cowardly it is to steal birds' eggs, or throw stones at birds, or shut them up in cages, merely because the small songsters happen to be weak and defenceless, as they think. Yet it is a mistake to suppose that they have no protector; it is of the despised and persecuted sparrow—at which hardly one boy in ten can resist flinging a stone—that the Blessed Saviour said, "Not one of them shall fall to the ground without

your Father—not one of them is forgotten before God." How careful this ought to make those who fancy that there are too many small birds in the world, and who seem to enjoy taking their busy, cheerful, helpful lives away! "*Not one of them is forgotten before God.*" He has promised to feed them; they neither sow nor reap, have neither storehouse nor barn—God provides their meal.

And in keeping His promise to the birds by giving them constant food, it has pleased Him that they shall help the growth of our own at the same time that they find theirs. "Are ye not much better than they?" He will not feed the birds at our expense! Their thrifty, hard-won meals keep the little music-makers alive to cheer us by their song, while they assist us to carry on the work which Adam was bidden to begin, that of turning the earth into a blooming garden, as well as the place from which we get our bread.

Who throws a stone, who throws a stone
At the breast of a small bird, hits his own,
For God who the birdling's pain doth heed,
Notes a heart more hurt by a cruel deed;
Don't throw a stone!

Put down the gun, put down the gun,
Nor take the wee bird's life for fun;
No sport to see it panting lie,
For one who must as surely die!
Put down the gun.

Don't cage a bird, don't cage a bird;
In vain your own voice may be heard
Pleading one day for liberty,
Or here, or in Eternity!
Don't cage a bird!

Touch not a nest, touch not a nest,
The mother-bird will guard them best,
Those nestlings which God gave her free,
As well as thy own home to thee;
Touch not a nest!

## QUESTIONS.

Q. 1. How does a bird begin life?

A. It is born inside an egg-shell.

Q. 2. How many linings has the egg-shell?

A. It has two.

Q. 3. What is the use of the linings?

A. To prevent the liquid in the egg from oozing out.

Q. 4. Why is the shell itself made porous?

A. To allow a little air and light to come in to the young chick.

Q. 5. How are the bones of birds made?

A. They are made hollow, and lined with air.

Q. 6. Why is it cruel to keep birds in cages?

A. Because they cannot have enough fresh air or proper food, or freedom, or the company of other birds.

Q. 7. If you were to keep several birds together in a large cage, would they be happy?

A. No. Because they could not build their nests or rear their young in the natural way, or lead the life for which they were made.

Q. 8. Can a bird's foot be comfortable on a smooth, small, round, slippery perch?

A. No. They require a rough branch of a tree, and to choose it for themselves.

Q. 9. Of what use are swallows and other small birds?

A. They make the earth fit to live in.

Q. 10. Name three ways in which insect-eating birds are useful.

A. They clear the air and the water, besides saving corn and other crops from insects.

Q. 11. Of what use is the sparrow in particular?

A. He is of great use as a scavenger.

Q. 12. What text speaks of sparrows as being cared for by God?

A. "Are not two sparrows sold for a farthing? and not one of them shall fall to the ground without your Father." (St. Matt. x. 29.)

# Birds.

## II.

> "May the night never come nor day be seen
> When I shall scorn thy voice or mock thy mien;
> In classic ages men perceived a soul
> Of sapience in thy aspect, headless owl!"
>
> —*Wordsworth.*

ALTHOUGH the world would soon become unfit for us and for other animals to live in were it not for the useful work done by small birds, yet it is plain that if they were allowed to multiply quite undisturbed there would one day be so many that there would be nothing left for them to eat; so many mouths to feed would use up all the birds' natural food, and they would attack ours.

Sparrows and most of the smaller birds have several broods in the year, and it is wonderful how quickly quite a flock of them will gather where at first there were only a few. The house-sparrow has been known to give fourteen little sparrows to the world in a single season: the family of one pair. Great harm would follow if there were too many small birds,—the little things themselves would be starving and miserable, and they would destroy the earth instead of being a blessing to it. One little boy might be very useful to weed in a garden, but supposing that five hundred little boys all came at once and wanted to weed in it? They would certainly do much more harm than good; and if they

stayed there and refused to turn out when the master of the garden told them to go, he would certainly be obliged to send for a policeman to get rid of them.

Now, in God's great garden, the world, He has planned that there shall be creatures which keep others in check, thin their numbers, and act as a sort of police to prevent them from doing damage. The "bird police" who keep guard over the earth are called "birds of prey;" and in England we have two sorts which take it in turns to work, the one by night, the other by day. English birds of prey used to be much commoner than they are now; and the king of them all, the grand eagle, was often to be seen, besides the kite, the hobby, the merlin, the harrier, and many others. Hardly any eagles are left now; and if people go on shooting and trapping owls and hawks as they have done hitherto, there will soon be none of these left either, and then we shall begin to find out what useful creatures they were, and to wish that cruel and careless people had not shot and killed them in such a hurry.

Jays, magpies, and a few other birds, prevent the over increase of smaller kinds chiefly by sucking their eggs; but hawks and owls will pounce upon almost any bird, not of their own sort, and kill it.

The only birds of prey which we are likely to see nowadays in our English fields or woods are, by day the sparrow-hawk and kestrel, and by night the barn owl and the brown owl; and these are indeed worth their weight in gold to the farmer if he would only believe it. A great naturalist has said that each farmer "pays the price of a sack of corn for every owl nailed to his barn door"—and that the death of a kestrel may be "fairly reckoned a loss of five pounds:" while a sparrow-hawk, if left to himself, will save the wages

of at least three boys by scaring away birds from the ripening grain. The owl, he means, if left alive, would have killed the mice and birds which would have eaten a sackful of grain—and the kestrel would have saved the farmer five pounds worth of his goods in the same way.

Hawks may be known by their curved beaks, their high-shouldered flight, strong and swift, and also by the terror which all the small tribes show when they see one coming. I once heard a great commotion and chattering begin suddenly among a peaceful flock of starlings which were feeding in a field through which I was walking. They began to hiss, scold, and scream, and to fly round and round in a perplexed, uncertain way, as if they did not know which way to fly. I looked up, but could see nothing in the sky—but presently, in a small hawthorn tree, I noticed a bird with a parrot-like beak, keen yellow eyes, and feathers curiously barred and mottled. It was a sparrow-hawk, and he was watching the flock of starlings, but how they knew that he was there I cannot say.

The beautiful little kestrel, or windhover, as it is sometimes called, has a habit of floating with outspread wings in the air, with its head turned towards the wind. It shivers its wings all the while to keep itself from falling, while it watches for a mouse, lizard, small bird, beetle, even a snail or slug below; for its sight is so wonderfully keen that it can see the smallest creeping thing upon the ground. It swoops from the height and kills its prey usually by the force of the shock; or by driving its claws into the victim; and it puts the creature out of pain, if not dead, by crushing the head with its strong beak. All is over in an instant. If a hawk is feeding on a bird, after having killed it, he partly plucks the feathers, breaks the bones, and tearing the

body to bits, swallows it piecemeal. The kestrel feeds more largely on beetles, cockchafers, and such small fry, than it does on mice, or birds, though it also eats these. The sparrow-hawk feeds almost entirely on birds. Both of them do immense service, and save the farmer much money by killing and driving away mice and birds from the standing corn, and in the farm-yard, too, when allowed to visit there, by chasing the flocks of small birds away, which have congregated to eat the fowls' food, and to rob the barns.

Hawks build their nests very high up in trees; it is said that the kestrel generally uses a deserted rook's nest. It lays four snow-white eggs, and feeds its young on slugs, snails and beetles. If a pair of kestrels could be persuaded to live in a garden, they would be the best helpers that the gardener could possibly have; and though all hawks are of a bold, brave, fierce character, they may be tamed, when they will show great affection and gentleness.

A gentleman once coaxed a young sparrow-hawk to make friends with his pigeons, and to go in and out as they did. It lived among them, flying by day in their company, and going home to the pigeon-house at night to roost with them. At first the pigeons showed great fear of the hawk, but they soon learnt how gentle, playful, and harmless he was. He would feed from his master's hand, and never showed any ferocity at all.

After the hawks have done their day-duty and are gone to rest, their places are taken by the "night patrol"—the owls begin their work.

Of these the largest, or snowy owl, is now rarely seen; the commonest owls are the barn and the tawny or brown owls.

The barn owl is a most lovely creature, clothed in

exquisite, fluffy, white down; while its back, wings, and shoulders are covered with fine streaks and dots which look like silver and gold dust sprinkled over them. His neck is so much muffled up in feathers that he almost looks as if he had no head at all, and people have called him "the headless owl" for this reason. His wings are fringed at the edges so that they beat the air quite quietly; and he begins to hunt about an hour before dark, by flitting noiselessly along the hedgerows or the outskirts of a wood. Then, woe to the small bird not gone safely to roost, or to any tiny, creeping mouse which has ventured out for food or play!—nothing escapes the great, clear, bright eyes of the owl; not even the slugs and snails; for he is fond of these as well as of larger prey. The eyes of an owl, like those of the cat, see best in the dark—indeed, the night bird's whole face is curiously like pussy's. The beak is almost hidden by soft feathers—and so are the ears. His face looks so solemn, wise and grave that in old times the Greeks called the owl "the bird of wisdom," and made it sacred to Minerva, the goddess of wisdom.

Though some owls have long ears standing out from the head, those of the barn and tawny owls do not show at all; yet if search be made among the feathers of the head, it will be found that they have ears more like those of a human being than any other bird possesses; for they are made with a sort of funnel of feathers round them, in shape not unlike the outer part of our own ear. Each ear has a valve or opening, into which the funnel-part draws all sounds. This wonderful ear-trumpet arrangement is given to the owl that he may hear the lightest rustle of his prey as it creeps in the grass or stirs in the hedge.

The barn owl does not hoot; he only makes a kind of

scream. The tu-whitt, to-whoo! which rings through the woods at night is the cry of the tawny or brown owl, which is rather common, and which builds its nest, like other owls, in some hollow tree or old ruin.

When owls have young in their nests they are most attentive to them; they rear several broods in a year, and the barn owl has been seen feeding one family while his wife is hatching eggs for a second brood. The father and mother owls have been watched going to and fro, attending to their young, and it has been proved that one or other of the parents comes once in every five minutes to the nest, bringing a mouse, or some small creature as food. Sometimes the barn owls bring rats for their young; but the tawny owls feed their nestlings chiefly on snails, slugs, and worms or small snakes. As many as twenty good-sized rats have been counted in a barn owl's nest!

It seems strange that a bird no larger than a barn owl should be able to swallow a creature of the rat's size: this owl is not nearly so large as an ordinary cat when sitting upright. But owls, like all birds of prey, have an enormous gullet or throat. The insides of all birds are more or less alike; that is, the mouth leads into a gullet, or throat, the throat into a crop or first stomach where the food is softened. Some birds, like doves and pigeons, prepare, or partly digest, food for their little ones in the crop, and bring it again into their mouths to feed them with.

The food passes from the crop into a second stomach where it is mixed with other juices, and from that into a third stomach or gizzard, which, in some birds, acts something like a coffee-mill, for it grinds up the food small, so that it may mix with the blood and form flesh, bones, etc.

In birds of prey the gullet is *very* large compared to the

rest of the body, so that they are able to pass things of a great size through it.

An owl eats his prey whole, unlike the hawk. When a barn owl has caught a mouse or little bird, it kills the creature by one smart bite across the back, and then tosses it into the air as if to make quite sure that it is dead. It may be that our house-pussy's habit of playing with mice she has caught had its beginning in some such custom; only she has lost strength and fierceness, and does not carry out her old merciful plan properly. The owl then catches the mouse or bird by the head and swallows it by degrees, just as it is, and afterwards throws up a ball or pellet—not round, but oblong, made of the bones, fur, feathers—all the hard bits rolled up together. The softer portions pass on into the stomach and stay there.

These pellets or balls are to be found near the nests of owls, and people have discovered, by taking them to pieces, how many mice, rats, or birds, the owls have eaten.

One naturalist collected 126 of these pellets, and in these he found the remains of 6 rats, 42 mice, 296 *voles* or field mice, 33 shrews, and 18 birds! So this owl must have been a useful neighbour to the farmer! In 25 pellets of the barn owl there were found traces of 6 mice, 35 voles, and 2 birds; and by looking carefully at 706 pellets of another barn owl there were seen bones of 16 bats, 3 rats, 237 mice, 693 voles, 1500 shrews and 22 birds! How very foolish the farmer is who shoots—or allows to be shot—any of these valuable helpers.

The little shrew-mouse, if permitted to have his way altogether, would soon ruin all the grass in the country. No cat or dog will touch him, because of his strong smell. The owl is the only creature which will serve to keep his

numbers down, yet not entirely exterminate him; this would not do, because as this wee creature feeds largely on insects, he must not be looked on as altogether an enemy. He is not so unless he increases undisturbed.

A short time ago quite a famine threatened some parts of the north of England, and in Scotland the crops for about 19,000 acres were destroyed; grass, corn, turnips, everything, all by the attacks of mice. At first they only settled on the boggy, useless lands, where they did more good than harm; but as the owls and hawks were not there to keep their numbers within bounds, and as every little mouse had about sixteen young ones several times a year, there was soon no more room for them in the wilder tracts of country. They were obliged to spread all over the cultivated lands; into the cornfields, pastures, and even the gardens. Flocks of owls and hawks, hearing the news, came from all parts to the places where this plague of mice had broken out; and it was most fortunate that the farmers saw this, for it taught them a double lesson. First, they were convinced of how terrible it would be if mice overran everything, and of how powerless they were to stop them; and next, it was plainly proved to them who their best friends were;—that God had made the hawks and owls by one of His wise plans, and out of His great goodness, in order to prevent such plagues and famine.

It would mean starvation for all living things—man as well as beast—including the tribes of tiny creatures themselves—if they were all allowed to live, grow up, and multiply at their own will. They would have to die slow and miserable deaths after having stripped the fields of all vegetation, instead of the short, swift, almost painless end which a bird of prey brings to them with its sharp, strong

claws and beak—tools made for the purpose. When God allows death to His innocent creatures, it is a kind death; only those which men invent are cruel. We ought never to allow anyone to say that God has planned anything cruel without contradicting so false and wicked a speech.

Too many little birds would be quite as dangerous as too many little mice; but there would never be one too many if man had not foolishly interfered with God's plan by killing all the birds of prey as well as by destroying creatures like the hedgehog and weazel, which suck their eggs or kill the young. The best way *now* would be to protect carefully every hawk and owl, and see if we cannot undo some of the harm already done; and then in time they may increase and we may have enough again to keep matters right. Instead of trying this simple way, when they find that there are too many sparrows, the farmers form stupid and brutal sparrow-clubs, and pay people to kill them, which makes things worse still. In Maine and Auxerre, parts of France, where all sparrows were one year ordered by Government to be killed, they had *everything*—even green trees—destroyed by caterpillars the following season. For sparrows in autumn eat not only seeds of weeds, and scraps, but they catch butterflies, moths and flies, which at that time are all laying eggs. And the worst part of small bird killing is that the ignorant countryman, who hardly knows one bird from another, shoots or traps all alike, and destroys by the dozen those which, like the redstart, hedge-sparrow, fly-catcher, skylark and others, do no harm but unmixed good to crops. Sparrows we cannot safely destroy altogether; that is certain; and so long as bribes are offered to men and boys for doing it, there is a great danger that their numbers will become too few. The best club to form would be one

which preserved hawks and owls, which know how to do the work in moderation, and give the poor sparrow a fair chance of escape.

It was only the other day that the newspapers told of a gamekeeper who seemed quite proud of having caught a hawk in a trap; so he wrote to the journals, or got somebody else to write and tell the tale, and to say that while the poor tortured prisoner was struggling there its mate had come down to console and feed it;—the remains of what he had brought her were found scattered about the ground. How long had that captive bird been lingering in terror and anguish there? For how many hours or days had the faithful mate waited on it, regardless of his own safety? It is a wonder that any man could tell such a story without feeling ashamed of the part he had taken in it, and without adding that he set the pair of useful, loving creatures at liberty to roam together where they would.

Make up your minds, all who read this, never to harden your hearts by taking any share in such cruelties—no—not for any reason whatever! and do not let any amount of silly sneers or fool's laughter hinder you from standing up for the weak when you can. If you are ever tempted to be cruel to any innocent creature, and all God's brute creation is innocent—remember that there is another life after this, in which you will have to meet the God who made the beasts as well as you, and to account to Him for what you have done. Remember that He sees all you do—that great and terrible God into whose hands the Bible says it is a fearful thing to fall, yet who loves you and longs that you should be merciful like Him; and He cares for the pain of a sparrow wounded by a stone. Do not set traps for living, panting, suffering, trembling things to be tormented in—do

not make prisoners of them—which is even worse than killing them; and refuse to have for your friends those who do such things, unless you can help them to alter.

It is especially cruel to keep owls or hawks captive in any way, for it is quite impossible to feed them as they ought to be fed; and they are made in such a way that their own sort of food and no other kind will keep them in health. A so-called lover of birds once kept a wretched owl in a hamper for several weeks, after which time he says, "it appeared to want more air and exercise"—I should think so!—and then he chained it to a perch by one leg. "This, however, proved the death of the poor owl, for it pulled so hard at its chain and was so restless that it cut its leg to the bone, completely dividing the skin, and causing the leg to swell to such an extent that the ring could only be got off by breaking it."

This account is given in the words of the person who did this thing; and they prove how very mistaken people's ideas of kindness may be. This man thought himself humane. What would any kind-hearted person, or anyone with any feeling, have done? Why, taken the poor thing to the nearest wood and let it go! But listen to what he did next. "The chain was immediately *changed to the other leg*, being fastened to a band of soft leather instead of a ring; but the remedy came too late, for the owl's appetite failed, and it finally died from the injury caused to its interior by a great pebble which it had contrived to swallow."

I have told this very sad story to show you how easily people may deceive themselves, who fancy that they are very fond of animals and very kind to them. If this naturalist, who has a great name, which I will not repeat, had really loved birds, he would have let this pretty creature go

to find its proper food, mate, and nest; or, better still, would never have taken it prisoner. He could not have borne, if a truly good man, to have seen it fretting and pining its sad life away till at last its misery was ended by swallowing a great stone! Such a sight could not please anyone whose heart was right. The food which was supplied to this owl could not have been of the right kind—men are not mouse-hunters, or else it could not digest it without exercise; no doubt it had been impossible to procure enough of the proper food for it. Its inside had been made to receive a mixture of bones, fur, and flesh; hard and soft matters together, and could not act properly without that; so it tried to supply the want by swallowing the first hard substance that it found. The gullet and coop of this miserable victim were quite unsatisfied and empty; for they were meant to contain a certain weight of food, of a particular kind, which the bird, if in a state of freedom, could have found for itself. In a room, garden, or stable, fastened up, no bird can be fed as it ought to be.

In birds of prey the gizzard or grinding stomach is not so strong, large, or hard as it is in those birds which swallow grain whole; for it is in the upper stomach that their food is prepared. Poultry, on the other hand, have a very large, tough gizzard, and they ought always to have this in working order or their food will not do them any good.

We often hear accounts of poor cocks and hens which, having been wrongly kept, have been obliged to swallow all sorts of things to put their gizzards right; and it is common to sprinkle sand, or road grit in the bottoms of cages where birds are kept—the birds only want it because they cannot then get their natural, rightful food or exercise.

In the body of a common fowl were once found, three

pieces of flint, three metal buttons, fourteen nails, some of them very sharp, in addition to a great number of stones. It is most likely that this fowl was shut up in a small place and not allowed to run where she could find green food, sand, ashes, or lime.

Many people seem to think that poultry can be kept *anywhere* and *anyhow*. This is a very great mistake. No one should keep fowls who cannot give them a place to run about in, plenty of food, and, if they are swimming birds, a good pond or stream.

The eggs and flesh of poultry are not wholesome unless they have been well and cleanly kept. Fowls require shelter and sunshine and an airy, well-ventilated house. Every fowl-house should have two sets of perches; one for the heavy birds near the ground, and one for the light ones higher up. There should be a ladder provided if the perches are high.

Scaffold poles are the right size for perches; or better still, rough branches of that thickness; the feet and legs are injured from having too small a foothold; they should not be obliged to stand with the foot flat, but the perch should afford a good grasp without cramping the claws—the mere sticks sometimes given to fowls for roosting on are very bad, for their bodies are heavy, and ought not to be thrown on the clenched claw for support.

The floor of the fowl-house should be covered with ashes, sawdust, or some substance which can be swept away *daily*. These sweepings from the fowl-house are very valuable as manure, and are worth from three to seven shillings the hundredweight according to the market, so there is no extravagance in the plan.

Fowls should be fed with soft food in the morning (warm,

if possible), and with hard food at night; because after the night's fast they will feel nourished more quickly by food which will not have to be ground in the gizzard before it is ready; but at night they will be sustained for a longer time by the food which is slower of digestion. Spratt's meal put to stand for twenty minutes in a bucket of boiling water makes an excellent breakfast for poultry. They ought to have green stuff given to them when they cannot be turned out, but if they can run in a field they will find all that for themselves, besides much other good food such as snails, slugs, and insects, all of which make fowls lay well.

Plenty of ashes should be given them to bathe in; they will have *no fleas* if this is attended to. A heap of lime in the corner of a fowl-house is a good thing; and should a rat put in an appearance his hole may be stopped with it. Rats never work through lime—it will make them go elsewhere.

Those who really take care of their fowls will soon find out how clever, affectionate, and happy they may be made in captivity; indeed it can scarcely be called *captivity* where liberty and exercise are given every day and a comfortable house provided to which the birds can go of their own free-will as soon as dusk draws in. Fowls know when bed-time comes by the light; and it is said that during a great eclipse of the sun in 1715 everybody's cocks and hens went to roost at midday. We all know what a famous hand the cock is at telling us about the sunrise by his crowing.

A merciful death when their time comes, and careful packing when they have to travel—this is the least we can do for our feathery pets. They ought never to be *crowded* into hampers, or to have their legs tightly tied together, or

to be carried head downwards, or to be packed one above another. They cannot ask these things for themselves. We ought to attend to the matter without being asked, for our own sense ought to teach us that such ways are cruel. Plenty of fresh water should *always* be within reach of fowls.

The language of the mother-hen when she leads about her chicks is very expressive. She knows how to speak lovingly to *them* if she cannot plead for her own wants; and the little downy yellow things understand her well.

So devoted a mother is she that, when wishful to make men understand something of His own tenderness towards His people, the blessed Saviour said: "How often would I have gathered thy children together *even as a hen gathereth her chickens under her wings.*" The hen's love is all for her chickens—none for herself. She forgets her own wants and weariness and pain when she has her brood to care for; she knows her greatest happiness, not when she is making *herself* comfortable, but when she fluffs at her feathers and stretches forth her wings to make a shelter for them.

Shall we not imitate her love a little; try to think of the helpless creatures trusted to our care a little more, and of ourselves a little less?

In so doing we shall imitate not only the mother-bird, but Him who said that her love was not unlike His own.

The bird of wisdom on the wing
A word of warning stoops to bring
The wise unto;
Tu-whitt, tu-whitt, tu-whoo! he cries;
A word of warning to the wise—
Tu-whitt tu-whoo!

Don't shoot the bird that kills the mice,
But do your best (that's my advice)
To cherish it;
Or else you'll hear Sir Mousekin say—
"The owl's away, so we may play
Tu-whoo, tu-whitt!

"The owl is dead, he has no power
To catch us forty by the hour,
And eat us too;
No owls by night! no hawks by day!
At last we mice can have our way,
Tu-whitt, tu-whoo!"

They'll eat you out of house and home
When owls no longer nightly roam
Or softly flit;
You'll know your friends from foes one day
When you have chased us all away,
Tu-whoo, tu-whitt!

If barns be robbed, and spoilt each rick,
And grass destroyed by gnawing trick,
As mice will do;
Don't grumble then;—for mousie's prank
You'll only have yourselves to thank,
Tu-whitt, tu-whoo!

The bird of wisdom as he flies
This message brings unto the wise,
And foolish too;
Tu-whitt, tu-whitt, tu-whoo; he cries
Beware! ye foolish and ye wise,
Tu-whitt, tu-whoo!

## QUESTIONS.

Q. 1. What do hawks feed on?

A. Small birds, mice, beetles, slugs, and snails.

Q. 2. What are the commonest hawks in England?

A. The kestrel and sparrow-hawk.

Q. 3. What are the commonest owls?

A. The barn owl and tawny owl.

Q. 4. What is every kestrel hawk worth to the farmer?

A. Every kestrel hawk may be said to save five pounds' worth of grain from sparrows and mice.

Q. 5. At what value has the dead body of one owl been rated?

A. At the value of a sack of corn.

Q. 6. Why must the number of small birds be kept in check?

A. Because they would soon multiply so fast as to eat the food of other creatures.

Q. 7. Why is it better for birds of prey to kill them than for men to do it?

A. Because birds of prey do the work in moderation, and as God meant it to be done.

Q. 8. What has happened in places where all sparrows have been destroyed?

A. On the next season all crops, grass, and trees have been devoured by caterpillars.

Q. 9. What has happened where hawks and owls have all been destroyed?

A. The whole country has been laid waste by mice until more birds of prey came from a distance.

Q. 10. What is necessary in keeping poultry?

A. A warm, airy, clean house, good food, exercise, good perches, ashes, water.

Q. 11. What else must we keep in mind about fowls?

A. To give them a merciful death, and, when travelling, plenty of room.

Q. 12. What text shows that the Saviour meant us to take pattern by the love of the hen for her young?

A. That in which He compared her love to His own. (St. Matt. xxiii. 37.)

# The Earthworm.

"That God would love a worm, I knew, and punish the evil foot
That wilful bruised its helpless form."

—*Blake.*

WHO would think that so lowly a creature as this should have had a large share in helping to make the world?

It seems impossible to believe such a thing; weak, frail, helpless, as the earthworm appears. And yet, in the hands of the Great Creator, who loves to work by humble means, it has been used as a tool in preparing this earth of ours as a dwelling-place for animals and for man.

In every country but those which are very dry, such as the sandy deserts of Arabia, the surface of the ground has been gradually covered with a coating of rich black or brown earth, made up of fine grains, into which the roots of grass, corn and other plants can easily push themselves, and which is full of nourishment for them.

The whole of this upper soil has been prepared by earthworms; has at one time or another passed through their bodies, and been thrown up by them in the form of *worm-casts.*

Professor Darwin gave much time and thought to proving this matter. Near his house in Kent, where the ground is very chalky, he caused a quantity of chalk to be spread upon a field. He found that earthworms covered the layer of chalk with seven inches of black mould in twenty-nine years.

The worm's work is slow but sure; and it must of course have taken a multitude of earthworms to do this.

Another field close to the first was covered with large flint stones, some of them half as big as a child's head; the field was called "the stony field" by the boys, and as they ran down the slope the stones clattered together. The smaller stones, Mr. Darwin noticed, disappeared at the end of a few years; so did the larger ones in time; at the end of thirty years a horse could be galloped across the compact turf without striking his hoof against a single stone. The worms had buried them all, and prepared the land for the grass, which had found footing there. When a trench was dug the stones were seen there the same as ever, but quite covered up with worm castings.

The body of the worm, feeble as it looks, is wonderfully fitted for the life it has to lead and the work it has to do.

At first sight the earthworm is not particularly attractive —quite the reverse—but we learn to respect the crawling creature when we understand the wonders of its labour and the cleverness and intelligence with which it toils.

The body of this creature is very elastic; when it is crawling along this can be seen by the way in which it first stretches itself out longwise and next shortens itself again. This movement is made by means of rings which surround the earthworm's body, from one hundred to two hundred in number. Each ring is furnished with bristles, which give the creature a hold on the ground. He stretches out one ring, draws up the next close to it, then the next, and the next; when he has got to the last ring he begins over again at the first, and so on, pushing out the front rings and pulling the others after them, by means of strong muscles which lie between.

It makes no difference to him which way he crawls; he can go tail-foremost as easily as head-foremost. He has no

eyes, no ears, no power of smelling; and, it is thought, no power of tasting; but he is able to *feel;* we know that because his nerves are plainly to be seen.

The worm always crawls with one particular side next to the ground, and on this side the chief nerve of his body is placed; running all the way down from head to tail beneath the skin, so that he may be able to feel when he is crawling over anything which would be likely to injure him, such as lime, dust, sharp flints, or broken glass, and draw back before he is hurt.

This great nerve has branches coming from it at each ring; these branches go quite round his body and give him feeling in every part of it. He has the power, if he should lose his tail by any accident, of growing a new one.

By means of his nerves he can *feel* rather than *hear* the lightest footstep, by the shaking of the ground; even so slight a movement as the tread of a bird will make him dart instantly into his hole. Birds know this trick, and approach the worm-holes very softly.

Also the earthworm knows whether it is light or dark by means of his brain. He is a night-roving creature, and is not fond of too great a glare. Mr. Darwin kept some earthworms in pots in his study, and he found that if the light of a lamp were cast on the earthworm's *head* he drew it quickly back into his hole, but if it shone on its tail the worm took no notice. The earthworm did not know that the light was there at all for a little time; because the brain, being beneath the skin, it took some time for him to find out that it was shining. How marvellous that without eyes a creature should be able to tell light from darkness! An earthworm takes no notice of any noise; not even if the shrillest whistle is blown quite close to it; the creature pays no

heed to any scent or smell however strong. It cannot feel the quivering of the air which a sound makes, it can only feel the shaking or vibration of solids like earth.

If you put your hand on the top of a piano when it is being played upon, you will feel a very slight trembling of the wood; if you place a violin on the top of the piano while sounding, it will tremble also, till the strings begin to thrill gently, and to give out by their movement a faint echo of the musical notes. This shows how sounds pass through solids, making them shake. It is this sort of shaking which the earthworm feels with his brain, and it makes him able to hear without ears.

Mr. Darwin placed a pot with an earthworm in it on the top of his piano. Though he set the air around it in motion by loud noises, such as shouting, the earthworm took no notice; but directly the notes of the piano were struck, it darted into its hole. The sounds had passed from the piano through the pot and through the earth, shaking it, and the worm had felt the disturbance.

If you strike the ground *above* where an earthworm lies in his burrow he will not come out, but if you dig *beneath* it he will come out at once, for he thinks it is a mole. He knows that moles attack him from beneath, not from above.

Earthworms perform three kinds of work in the fields and gardens.

Their first and most important service is to make good soil on the top of the clayey, chalky, flinty, or bad ground. This they do by swallowing earth, passing it through their bodies, feeding on part, and throwing back the rest made much lighter, richer, and better: or else by eating decaying leaves, and turning them into mould faster than they would be changed by natural decay.

The way in which earthworms collect leaves is very curious; they show great sense by always drawing down the leaf into the hole in the cleverest and best way.

A second useful task which they accomplish is to drain the land, which they do in making their holes; these let in air and make channels for the rain.

The third way in which they make themselves useful is by dragging seeds of trees and plants into their burrows, which grow when thus planted.

The hole of an earthworm generally goes down into the ground in a nearly straight line, sometimes for two, three, or four feet. It is lined and made smooth by a gummy or slimy fluid which oozes from the worm's body; but here and there the worm makes small lumps stick out from the sides of the burrow, to act as rests for his bristles as he climbs up or down.

At the bottom of the hole is his little sleeping-room. He lines this carefully with small stones or seeds to keep it dry, for he dislikes the damp, cold ground, and he lines the top of his burrow with leaves when he wishes to sit there for a change.

He lies in his little room at the bottom coiled up all the winter time, but in summer he is fond of lying at the mouth of the hole, sometimes with his whole body outside, keeping only the tip of his flat tail inside as a guide to the spot in case of alarm, when he hurries down with a jerk. At other times he lies only half-way out, with nothing but his head showing—if he wishes to have some warmth from the sun. When the weather is cold, yet not frosty enough to drive him below, the worm plugs up the mouth of his burrow with leaves to keep out the draught, and stays at the top, thus keeping himself comfortable, and getting the

benefit of what sun-rays there may be. This stopping up of his hole is very knowingly done by putting leaves into it, in a sort of parcel, one fitted behind another, the cracks between them being fitted in with earth. Now and then, if leaves are not at hand, the worm will use a little heap of small stones, or a single larger one; these he manages to draw across the opening by using his mouth as a sucker. A stone was once found weighing nearly two ounces which had thus been drawn by a worm across the opening of his hole. The inside of a worm's mouth has no tongue or teeth; he manages to eat without either, because he feeds on decaying substances only, or almost entirely on them; they are his favourite food, for he cannot gnaw anything at all tough. The head of a worm ends in a sharp tip; just beneath this point lies the opening of his mouth, which does not go across it, but the long way. When he eats he draws the upper and lower edges of his mouth together, making his head short and thick by doing so; using the edges of his mouth for cropping, like lips. His food passes down a long throat or œsophagus into a sort of crop; next into a gizzard, where it is ground up. The worm swallows little stones, which go into the gizzard and do instead of teeth. Then his food passes out of the gizzard into another passage, and after the worm has kept back what he needs to keep him alive, the rest is thrown up at the mouth of his hole in the shape of beautiful, fine, rich black mould, fit for grass and flowers to grown in. This is his helpful work for us.

The worm has one habit which no other creature has formed. He is the only animal which *digests his food before he eats it.*

When the worm cannot find leaves which are decayed

enough for him to eat with comfort and ease, he sends out from his mouth a juice which causes a fresher leaf to blacken and decay; softens it, half digests it, so to speak, before he swallows it.

Earthworms are very useful in sowing seeds of trees and keeping them from being eaten by mice and birds; this they do by taking them down into their holes. Grains of corn are often found in a sprouting state in the holes of worms, as well as young trees; the worms sowed them.

The earthworm cannot live for a long time under water; it will drown after a while, because it breathes by drawing air in at all parts of the body nearly. It is kind to take them out of water therefore.

They seldom travel far from their burrows, unless their holes have been destroyed, or they feel that they are going to die. But as they suffer much from dryness when on a journey—not being able to live in a room for more than a few hours without moisture—it helps them to be sprinkled with water or covered with earth when going across a dusty road. If we find an earthworm in trouble, we must not be ashamed to help the creature. We must remember that it is not a low or mean thing, but a wondrous work from the hand of God, and rescue it if we can. For the sake of the Creator, all that He made should be reverenced, however small.

When the Saviour of the world came among men, He was despised and rejected by them—we have all read, and know it. So that in speaking of Himself in the Psalms, the Messiah says, "*As for Me, I am a Worm, and no man; a very scorn of men, and the outcast of the people.*"

This creature, then, which does so much for us, yet is so contemptuously, ungratefully, and carelessly used;—passed

over with disgust or heedlessly crushed by the passing foot, is a type of Christ. Let us think of this; and also of the Psalm which calls not only on "feathered fowls," but on "*worms*" also, to "praise the Lord."

The earthworm is a pattern to us by doing his little bit of work in the world without fuss, or noise, or boasting; and thus, without a voice, or eyes, or ears, it does praise its Creator.

Worm, worm, what can you do—
What is the use of a thing like you?
What do you live on, how do you feed,
Do you earn your keep—do you live for greed?

Oh, no! for I work with my tiny rings,
As well for the world as if I had wings.
And first of all, I've a strange inside,
More useful than yours, with all your pride!

I swallow the earth, thick, clammy, and cold,
Then cast it up as fine, soft mould;
I loosen the ground and drain it dry,
Though none see me work, so silent and shy.

But not only that—now do not sneer;
Besides being born a drain engineer,
I'm a husbandman too, for the seeds I sow,
For many a fair waving tree to grow.

For as I am drawing a dead leaf to eat
Down into my hole, without hands or feet,
I drag the seeds too, which quickly sprout;
Now what would you do the poor earthworm without?

So if you should find me in trouble to lie
In a wayside puddle, where I must die,
Give me a chance on dry land again,
God formed me, created me not in vain.

And if you should see me all dusty and dry,
A sprinkle of water! to bury me try!
Let me live out all my tiny term,
For His sake who likened Himself to a worm.

## QUESTIONS.

Q. 1. What are the uses of an earthworm?

A. It drains the land, makes good soil on the top of bad by its castings, and often sows the seeds of trees.

Q. 2. How does it drain the land?

A. By making burrows, which let in air and form channels for the rain.

Q. 3. How does it improve the soil by its castings?

A. It swallows the earth and decaying leaves, passes them through its body, and throws them out again as fine rich mould.

Q. 4. What sort of body has the worm?

A. An elastic body, with from 100 to 200 rings round it.

Q. 5. How does it move?

A. By pushing the rings along.

Q. 6. How is the earthworm able to hold on to the ground, or to the sides of its hole?

A. By means of bristles, which grow all round its rings.

Q. 7. What sort of mouth has the earthworm?

A. A sort of slit, without teeth or tongue, which he uses by pressing the edges together firmly.

Q. 8. When the earthworm swallows food, where does it go?

A. Down the throat into a crop, then into a gizzard, where it is ground up.

Q. 9. How does the earthworm make up for want of teeth?

A. He swallows small stones which do instead, grinding up the food in the gizzard.

Q. 10. Can you tell of a habit which the earthworm and no other animal has?

A. He digests his food before swallowing it, by mixing a juice from his mouth with it.

Q. 11. How many inches of mould did earthworms put on a field in thirty years?

A. About seven inches.

Q. 12. What does the Psalm say about worms?

A. That they "praise the Name of the Lord." (Psalm cxlviii. 10.)

# The Wireworm.

"Partake my confidence! No creature's made so mean
But that, some way, it boasts, could we investigate
Its supreme worth: fulfils, by ordinance of fate
Its momentary task, gets glory all its own,
Tastes triumph in the world, pre-eminent, alone."

—*R. Browning.*

After the rooks and starlings have reared their young and wound up their family affairs for the year, they go away in company with the jackdaws into large pastures and brown ploughed fields, where they may be seen by hundreds feeding together very much as flocks of sheep do. The rooks generally take it in turn to stand sentinel; for a couple are generally to be seen on the watch in some tree, bush, or top of a wall, ready to give the alarm to the rest when anybody is coming.

And the watchman rook knows the difference between a man and a woman very well; is not afraid that the harmless person in petticoats will shoot him or his friends; and scarcely takes the trouble to give notice of her approach as he flaps lazily a couple of yards out of her way. Also he has learnt that walking-sticks do not go off with that dreadful pop and bang that kills, but that guns do; he knows the way in which each is carried, and if a man should shoulder his walking-stick as he comes into a field, all the rooks will be off, though they took no notice of it before.

The farmer has made a great mistake in creating this fear of the gun. Each rook in his field is doing him good

at the rate of five shillings a week at least; by prodding and digging in that way; while the loose earth which he turns up is carefully searched and examined by the troops of jackdaws, starlings, and sparrows that follow to pick up the rook's leavings, because their beaks are less able to break up the hard ground than his.

Look how earnestly he is at it! pushing his strong, sharp beak deep into the soil, jerking, pulling, and tugging, as if his life depended on his work. Sometimes he buries it so far in the earth that one would think he never could get it out again; but no—it never sticks there, for it is wedge-shaped and slips out as easily as possible.

At the broad end of the beak, next to the rook's forehead, is a tough, horny bit of skin, that guards the small feathers around the root of the bill from being rubbed or broken, which would be very painful. It seems as if the beak of the rook were formed, as a pickaxe is, on purpose for such labour; and so it is, but far more skilfully than any tool of man's making could be. And in what way is this clever spadesman helping the farmer who rewards him not with a welcome, or wages of any kind, but with abuse, and fire and shot and scarecrows?

The rooks and the starlings, the jackdaws and their train of little sparrows too, are all busy at their work of clearing the ground from grubs, as well as from the eggs which are their beginning.

The mother cockchafer, as well as the females of many other beetles, and of the grasshopper, carry at the tail a long spear given them on purpose for piercing the ground at the time when they wish to lay their eggs.

After the holes have been made, eggs are dropped in and the grubs are hatched from them in due time an inch or

two inches beneath the surface of the ground, among the tender roots of the grass, upon which the hungry creatures begin at once to feed, making tunnels or burrows for themselves as they move along, and of course causing the plants to die of which the roots have been nibbled away.

Next to the cockchafer grub, that which the farmer most hates is the wireworm, or grub of a skipjack beetle, which for five years lives underground, working its way silently and out of sight beneath the turf or corn, its passage only known by dry withered patches above, where handfuls of grass either shrivel up and are blown away by the wind, or are pulled out by sheep and cattle in grazing, because the tufts have no root, and come up with the least pull.

"What a terrible pest! What mischievous, useless, harmful plagues!" some people will say; "surely nothing can be said for such creatures as these! Why were they made to do nothing but evil?"

Stop a minute. Do not be in quite such a hurry—do not condemn anyone, even the poor wireworm, quite unheard; and since he cannot speak for himself let us see what can be said for him, and also in behalf of the cockchafer grub, for whom scarcely anyone has a good word.

First of all you must remember that men, by cultivating the soil, have altered the plans of the Great Creator for keeping the world in order. They have been permitted to do so.

When God first made the world there were no farmers, ploughmen, and woodcutters needed to toil and moil at tilling the ground. It was only when Adam sinned by disobeying his Maker and Heavenly Father, that, as a punishment, and also as a means of making him better, hard

labour was given him to do; he was to eat bread earned in the sweat of his brow.

Before that, the world was kept in order by God's humbler, lowlier creatures, as it still is in lands where no man lives, just as at the time when the greatest and nearest to Him, human beings, had not fallen so low as to be obliged to work as meaner animals do. And so we shall find that every creature has a place in the plan which God made, and which acted perfectly till man's sinfulness and the wiles of Satan interrupted and spoilt it for a time. It will come right again some day; in Paradise, when man sins no longer, and he, as well as the other creatures, will not suffer any more. The Bible promises us that then we, and not only we, but the creatures also, shall be "delivered from the bondage of corruption into the glorious liberty of the children of God." Now in the meanwhile we shall find that in God's great garden, where it is left alone by man, the plants need not only air, light, sun, and rain,—to be sown, planted, and tended; but they also require, just as anyone who has a garden-bed of his own will find out, to be thinned, from time to time, the straggling branches cut off, the old decaying roots taken away, to make room for fresh ones.

Nothing will grow well in any garden which is allowed to become choked and overcrowded and tangled up; and if the roots be matted together underground, it is even worse for the plants than when the leaves and branches grow into a thicket.

The office of the wireworm, the cockchafer grub, and others of the same kind, is to do *root-pruning*. By eating away a certain quantity of the roots of grass, that is, they strengthen the remainder, get rid of feeble old plants, and make way for young seedlings.

Many of our common meadow grasses are annuals; they die down each year after sending out seeds or little off-shoots which take root. Others are perennials, growing on from year to year; but the old plants become very rank and coarse in time, unfit for cattle or sheep to eat; and the cockchafer and wireworm, by gnawing off the roots of those tufts which are over and done with, cause them to wither away and give place to the freshly springing shoots. This is doing a good work, not a bad one, for the farmer.

In corn-fields and among other crops little damage would be done, but perhaps the contrary, by "thinning out" here and there a plant which would make the rest grow, thrive, and bear more freely. But unfortunately the farmer has brought on himself a terrible trouble by his short-sighted folly in getting rid of as many rooks, jackdaws, and starlings as he can, mistaking them for enemies; and the result of this is that too many cockchafer grubs and wireworms are left: they have become a destructive power in his fields instead of a helpful one.

If the farmer could once be persuaded to leave these birds alone, they would protect his crops from over-increase of these grubs which dwell beneath the ground's surface where he cannot reach them. But on this subject, English farmers at any rate are very obstinate still, although it is to be hoped that they are beginning at last to learn wisdom.

A gentleman was one day walking with a farmer across his fields, and noticing a network of strings and feathers stretched over the grass, he asked what it meant. "Oh," said the farmer, "I can't bear to see the nasty crows pulling up all the grass, so I've put that to frighten them away." This ignorant fellow imagined that rooks, like geese, ate grass! whereas it was the wireworms and cockchafer grubs be-

neath, from which he had driven the rooks, which were doing the mischief. The rooks had been toiling with all their might to stop the harm by gobbling up the grubs as fast as they could; and now the farmer was doing all in his stupid power to drive away his helpers. It was of no use to show him, by pulling up some of the loose tufts of grass, who his real enemies were; the obstinate man would not believe, even when he saw the grubs at work, so I think he deserved to have his farm spoilt. If people are silly, conceited, and wilfully blind, they must expect to suffer for it.

When the wireworm has finished its underground life it lies quiet awhile, in the form of a chrysalis, and then creeps above ground as a beetle which is able to fly, and which has a curious kind of spring by means of which it is able to put itself right side uppermost again if it should chance to fall upon its back, in a way that beetles sometimes get into trouble by doing. This beetle bends its body back till it is standing only upon its head and the tip of its tail; this lets the spring loose, and then it suddenly jerks itself the other way till its head and tail nearly meet. The spring flies back into its place, and sends the beetle up into the air with a little sharp "click;" as it is coming down it contrives to turn round and to alight upon its feet.

Some kinds of skipjack beetles lay their eggs in decaying wood instead of under ground, and their grubs, as well as those of other wood-boring creatures, do much good by helping to clear away old rotten stumps and tree trunks to make way for young trees. The rain runs in at the holes they make, causing the wood to decay faster; thus the wireworms are woodmen as well as gardeners.

Everyone knows the pretty cockchafer, with its delicately coloured pinky-grey back, which looks as if it had a bloom

upon it, and is of something the same shade as the gills of a mushroom, adorned with its beautiful black and white ornament like the teeth of a saw, arranged all around its sides like a vandyked border.

In the districts where rooks have been slaughtered wholesale, something very like a plague of these creatures has followed, not unlike the fearful locust scourge; the swarms of cockchafers covering the trees, and almost darkening the air by their flight.

Droves of pigs were sent out into the fields to eat them as they dropped from the trees; bushel-baskets full were collected and destroyed,—every means was taken to get rid of them; but they stripped every green leaf from each bough for miles around, making the earth a wilderness; ruined many farmers, and destroyed crops to a terrible extent.

It was found, however, that the following year the trees were not much the worse, neither did the herbage suffer destruction completely; and there is reason to think that the office of this vast visitation of cockchafers, like that of God's "great army"—the locusts—was not to bring utter ruin, but rather to prevent it, by acting as a warning to man not to destroy the messengers sent to help him—such as the rook.

The cockchafer is a pruner of trees, especially of the oak, which sprouts out with renewed vigour after he has paid it a visit: and with that grave policeman in plain clothes, Mr. Rook, to keep him in check, there is little fear of his doing any serious harm.

Not left alone, not by itself,
  Doth dwell the humblest thing that is;
Unmarked by God not one doth die
  Of all the creatures that are His.

He once prepared a pleasant gourd
  To shade His servant's weary head,
But lo! beneath the sun's hot rays
  It withered, shrivelled, and lay dead.

And why? Because it was His will
  To make a worm which gnawed the roots;
The same Hand formed its creeping shape
  Which clothed the plant with graceful shoots.

Fair in the sunshine waves the grass,
  Where butterflies flit o'er the sod;
While underneath it darkling delves,
  The worm no less prepared by God.

Toiling in earth like souls which dwell
  Below, yet scantily tastes earth's pleasures,
Waiting His hour to find their wings
  That day when He makes up His treasures.

## QUESTIONS.

Q. 1. What is a wireworm?

A. It is the larva or young of a beetle.

Q. 2. How long does it live underground?

A. Three or four years.

Q. 3. What does the wireworm feed upon?

A. The roots of grass and other crops.

Q. 4. Does it do any harm?

A. In moderation it does good by pruning the roots, getting rid of coarse, rank plants, to make room for fresh growth.

Q. 5. If wireworms over-increase, what can be done?

A. Nothing; but to encourage the birds which feed on them.

Q. 6. What bird is the chief enemy to the wireworm?

A. The rook.

Q. 7. In what way is the rook's beak fitted for digging?

A. It has a leathery pad at the root of the beak which prevents the feathers on the rook's forehead from being injured.

Q. 8. What other grub lives underground like the wire-worm?

A. The cockchafer grub.

Q. 9. What do full-grown cockchafers eat?

A. The leaves of trees, especially of the oak.

Q. 10. What has followed in districts where the rooks have all been shot by farmers?

A. A plague of cockchafers not unlike that of locusts.

Q. 11. Do all skipjack beetles lay their eggs underground?

A. No; some kinds lay their eggs in decaying wood.

Q. 12. Of what service are the grubs which bore holes in decaying trees.

A. They act as woodmen, helping to get rid of useless trunks and make room for young trees.

# The Snail.

"To grass, or leaf, or fruit, or wall
The snail sticks close, nor fears to fall,
As if he grew there house and all
Together."
—*Cowper.*

If a man who understood nothing about pruning were to watch a gardener as he was clipping and cutting fruit-trees, or taking off the young shoots of a vine with his sharp knife, he would most likely think that great harm was being done to the plants. "What a mischievous thing," he would say. "Why are you snipping off all those beautiful fresh twigs, and spoiling the tree?" But if anyone who understood the matter were at hand he would know very well that the pruning was very good for the plants, that the root was strengthened by losing some straggling branches, that where old leaves were snipped away new ones would spring forth, and that fresh buds would sprout wherever the old wood was cut off.

In the great garden of the world a whole band of creatures are always busy at work of this kind, and very little thanks they get for their labour. Among this class of workmen snails and slugs are some of the most active. Out in the fields and woods they keep the trees and the wayside and hedgerow plants in order, and all the while that they are checking overgrowth of herbage they are steadily preparing their own bodies as food for other creatures, so that they do a double service.

In our own gardens, small bits of ground as they are, which we have shut in for our own particular uses, and in which the great laws which govern the outside world are interfered with, the snail and the slug are found very troublesome. That is because they are tempted to come there and to breed in large quantities by the number of succulent plants which we grow for ourselves; also by the warmth and shelter of our walls, hedges, glass frames, and hot-beds.

They multiply peacefully in these places, because people are so unwise as to drive away the birds, to whom they will not spare a handful of their fruit, or take the trouble to place it beyond their reach by netting.

Also wild creatures such as the hedgehog, toad, and frog are usually absent, so that the crawling guests of the garden are little disturbed. In gardens their foes are looked on as man's foes too; so that they have over-increased, being left alone. But we must remember that the earth itself is of more importance than our little patches of garden land; the slug and the snail have their office there, and would be missed from the great chain of useful links.

The slug, or the shell-less snail as it is sometimes called, is hardly at all different from its cousin which carries a house on its back. All slugs have shells, though, curiously enough, they lie beneath the skin and do not show. One kind of slug, however, carries near the tip of its tail a small flat shell, as if it had thoughts of turning into a snail, but had stopped short half-way. Two of these slugs were lately found in a garden near Bristol; and the lady who had them kindly showed them to me. They were very curious, of a dull yellowish colour.

Slugs and snails are covered with a sort of mantle or

cloak, which is fleshy and thick; the edge or collar of this mantle sticks out from the shell of the snail, and from it a clammy, thick liquid oozes which is useful to the snail in many ways. The mantle protects all the delicate parts, as the lungs, heart, etc.; but in the slug it is shorter than in the snail.

Besides being wrapped in a cloak of his own, the snail carries on his back, by way of umbrella, tent, or dwelling, a most useful shell, as everybody knows. Some snail shells are prettily striped and lined with colours—such as pink, black, yellow, and grey, mottled with patterns, or neatly ornamented. The head of the snail or slug has four little horns or *tentacles* growing upon it, two of which, the larger pair, have black specks at each tip, which are the eyes of the creature. He can draw in these eyes with great quickness when the horn is touched; but he does so more from *feeling* than from *seeing* the danger. The eyes, ears, scent, and taste of the snail are less keen than his powers of touch. The snail pushes his horn in and out in telescope fashion, turning it inside out as we do in pulling off a stocking.

These creatures crawl by means of a flat foot or disc. This is placed on the ground, the edges are drawn up close together, and then the part of the foot lying nearest to the place which the snail wishes to reach is spread out, and the rest of the disc is drawn up to it. The flat foot working in this way is able to pull the snail along at a fair pace, and a quantity of slime which the sole of the foot keeps sending out helps the snail to glide smoothly onwards. The largest snail seen in England is not a native of this country, having in old times been brought from Italy by the Romans. It is very interesting to find one of these snails and to think of

its history, and that the stranger is descended from parents which those ancient conquerors of Britain brought over. It is called the apple snail or esculent snail, and is about three times as big as our largest garden one.

The most likely spot in which to find some of these Roman snails is where the remains of roads which those old invaders made are still to be seen. Following these tracks the country folk sometimes still find an apple snail or two. I have myself seen them near an old Roman camp, and along the hedges of such a road in Berkshire.

The habits of this snail have been more closely watched than those of any other, and most likely all snails are much alike in their ways, so that a description of this one's life will do for all land snails.

There are several kinds of water snail, which do, in ponds and stagnant water, the same useful work of pruning and clearing which land snails do on dry ground. The water snails have broad horns like fins, and look very graceful as they move: the services which they perform in cleansing the places they live in are immense, as they eat quantities of decaying weed as well as fresh growth, thus preventing the waters from becoming choked and polluted by floating specks of minute vegetable life.

The apple snail lays from twenty-five to fifty eggs in a hole in the earth, which it carefully closes up. This takes place in June. The eggs are hard, round, and rather clear—not unlike a small mistletoe berry. These it leaves to the care of the warm sun and kindly moisture of the ground. They soon hatch—the little snail gnawing its way out, a tender shell already on its back, and setting to work at once to eat the egg-shell which was lately its prison, as the habit of caterpillars is. The shell, instead of being twisted or

*whorled* several times, has only one whorl and a half at first; but after the snail has spent some time in feeding on earth, next on decaying leaves, it grows very fast, shell and all, till it is full-sized and able to eat fresh leaves.

The mouth of the snail or slug has an upper jaw like a curved blade, but is without regular teeth: the tongue is covered with many thousands of small prickles, which take their place; and with these the creature tears or bruises off pieces of leaf, mashes them up and swallows them. I once watched a huge slug eating very small toadstools in a fern-case,—they were scarcely larger than a pin's head,—and the slug cropped them off sharp and close, one at a time, bruising them between his tongue and upper jaw. The little crunching sound which he made could be quite plainly heard, and he seemed to be enjoying his meal very much.

The hole which a snail makes in a leaf is always towards the middle, never at the edge. Caterpillars and earwigs eat from the edge, and cannot begin at any other part. The snail cannot do as they do, because he cannot steady himself there, and his jaws, too, do not move sideways like those of the caterpillar, but up and down as ours do. When the frosts of autumn begin it is needful for the snail to prepare a winter lodging for himself. Some snails, especially in gardens, find a home ready made, in the crevice of a wall, an old flower-pot, or the corner of an outhouse.

But when he has nothing of this kind to trust in, the snail has a very remarkable way of building a house for itself by means of the foot, which can send out slime.

Having found a sheltered nook, he begins by preparing a quantity of thick slime on the sole of this foot. He then plants the foot firmly on some loose earth, and, turning on one side, pours from it more slime. The earth is left

standing like a little wall, and soon hardens. The snail then takes up another layer, working in the same manner, thickening his wall and making it strong. He turns himself hither and thither as he builds the wall all around, the slime becoming solid till it forms a smooth, hard, strong, and lasting piece of masonry. Having finished the walls, the little architect goes on to make a roof, contriving to plaster the earth and slime across till the walls meet in an arch and the whole dwelling is dome-shaped.

The snail is now left lying with the mouth of his shell facing the roof. He draws in his foot, leaving the edges of the mantle only to stick out. And now the snail does something more wonderful still. Before closing the last chink of the grave which it has built over itself, the creature breathes in a quantity of air, as much as it can. Then the snail shuts up his hole, breathes *out* some of the air, and next sheds a quantity of fluid from the edges of the mantle, which hardens into a thin film over the air, fastening it into a little cell or chamber. Then he breathes out more air, shuts it in by another film, then another breath and another film, and so on, till he has made five or six air cells or chambers, which, lying between himself and the cold world outside, serve to keep him warm better than any blanket. Two or three days are spent over the whole task, and then the snail goes to sleep in his snug house, hearing nothing of the storms without, forgetting the frost and snow. Unless some hungry bird should break in upon his nap, he is safe and sound till the spring sunshine rouses him.

How does he burst from the strong vault which he has made? In a very simple way. The snail begins by breathing *in* the air he breathed *out* before to fill his air chamber. This makes the cell burst; he breathes in the air of the

next, and the film of that cracks too; the same with the next and the next. When he comes to the thick outside crust, the snail makes a great effort. He is now growing more lively from the sun's rays; he pushes hard with his foot; by degrees the last wall gives way, and out he comes, a free snail, to enjoy life after his own quiet fashion.

In dry weather snails retire into their shells and close up the mouths of them with the ever useful slime, which keeps in the moisture of their bodies. They are able to patch their shells when broken by a fall or other accident, by applying the edge of the mantle to the cracked parts, and pouring out some fluid which mends the place. You might fancy that so cold-blooded a creature could not feel anything like affection or kindness, but it is not so. Snails are very friendly to one another: they live sometimes in pairs, and Mr. Darwin gives an interesting story of great faithfulness and attachment on the part of a snail towards its mate.

A pair of snails, one of which was weakly, was put into a small, poor garden where there was little to eat. After a short time the strong, healthy snail disappeared, and was traced by its track of slime over a wall into the next garden, which was well stocked. Everybody thought it had deserted its feeble mate, but no; after having been away for twenty-four hours it came back, and seemed to tell the other snail about the plentiful supply in the next garden, for both of them started of together, along the same track, and disappeared over the wall.

This shows that snails must not only have an affectionate fellow-feeling, but also in some way the power of speaking to each other.

If it is necessary to get rid of slugs and snails from a

garden, *lime* should never be used. It puts them to as much pain as they are capable of feeling, and does not kill them for a long while. If dropped into strong salt and water they die instantly.

But *birds* are the best corrective of snails and slugs. A jackdaw will eat a couple of dozen snails for his breakfast. He puts his foot on the shell, drags out the snail, and swallows it whole. Thrushes and blackbirds break the shell and eat piecemeal. They usually have a favourite large stone or gate-post against which they dash the snail.

Robins, sparrows, and other birds hunt for the *eggs* of snails in the ground; the glow-worm preys on snails, and carries a brush at his tail on purpose for cleansing himself from their slime. It is the height of folly for gardeners to chase birds from flower-beds and lawns: their presence there keeps a far more stealthy, sly, and mischievous burglar, the snail or slug, at a distance.

Up to a dwelling snug but frail
There leads a winding, silver trail,—
Within his house you find the snail.

He loves his little home so well
That wheresoever he may dwell
You never see him leave his shell.

With gliding foot on some green weed
He leisurely supplies his need;
His motto is, "More haste worse speed."

When he to travel has a mind,
He has no goods to lose or find,
No luggage to be left behind!

With calmness he away can crawl,
Tools, furniture, his cloak and all
Are packed within his mansion small.

Sure mighty love has stooped to heed
This lowly creature's smallest need,
And taught it how to rest and feed!

Yea, He who notes the sparrow's fall,
Whose footstool is the earth's vast ball,
Whose tender mercies brood o'er all.

## QUESTIONS.

Q. 1. What is the work of the snail and slug?

A. To check overgrowth of plants.

Q. 2. Is this a useful work?

A. It is good in the fields and waste places, but not in our gardens.

Q. 3. What is the best way of destroying snails and slugs in a garden?

A. To encourage the birds which feed on them or on their eggs.

Q. 4. Name some enemies of the snail and slug.

A. The thrush and blackbird and jackdaw, which eat them full-grown.

Q. 5. Name some others.

A. The robin, sparrow, and other birds which search for their eggs; also the hedgehog and glow-worm.

Q. 6. What is the reason that snails do no harm in the open country?

A. They are so well kept in check by wild creatures.

Q. 7. What covering have snails and slugs?

A. A fleshy mantle or cloak which protects the lungs and heart.

Q. 8. What else?

A. They have shells, which in the slug lie beneath the mantle, are small, and do not show.

Q. 9. What does the snail do in winter time?

A. He goes to sleep after building a wall of earth and slime round himself.

Q. 10. Has the snail any other use for his slime?

A. Yes; it helps him in crawling, and mends his shell.

Q. 11. How does the snail move?

A. By means of a flat foot or disc which he expands and contracts.

Q. 12. What is the most merciful death for snails and slugs?

A. To drop them into strong salt and water.

# Beetles.

"Dare'st thou die?
The sense of death is most in apprehension;
And the poor beetle, that we tread upon,
In corporal sufferance finds a pang as great
As when a giant dies."

—*Shakspeare.*

To any thoughtful person who walks amid the fields, woods, and lanes, it must often seem a very puzzling thing that so few dead bodies of birds or small animals are ever to be seen. And yet the hedgerows, meadows, and copses, the whole country, is densely peopled with living creatures: birds, mice, squirrels, moles, frogs, toads, and many others. By thousands they are born every day, and by thousands they must die. One would think that the whole face of the ground would, in time, become covered with this multitude of little carcasses. What becomes of all the tiny corpses? How is it that the air does not become tainted by them—the grass choked up and killed, the earth turned into an evil-smelling, unsightly desert, instead of being the fair garden which it is?

A sad and ugly state of things would indeed be brought about were it not for the friendly offices of a vast army of minute beings which act as scavengers, removing in various ways all that is offensive to sight and smell. Among the most active of this useful band are the sexton beetles, which bury the dead bodies of small animals and birds whenever they meet with any.

The first person who described the habits of this strange beetle was a German naturalist, who had often remarked that the dead bodies of moles disappeared in an extraordinary way when lying upon loose earth.

He placed a dead mole upon one of his garden beds, to see what would happen. By the third morning it had vanished, and on digging where it had been laid, he found it buried to the depth of three inches, and under it four beetles which seemed to have been the grave-diggers. The mole itself seemed to have no change in it, so he buried it again, and in digging it up at the end of six days found it swarming with maggots which were the offspring, as he supposed, of the four beetles, which had buried the mole in order to lay their eggs in it. To make quite sure he put four of these insects under a bell glass with some earth and placed two dead frogs on the soil. In less than twelve hours one of the frogs was buried by a pair of the beetles; the other two ran about the whole day, as if they were busy measuring the size of the other body, and on the third day that also was found buried.

He then picked up a little dead linnet and put it underneath the glass; a couple of beetles soon set to work. They began by creeping underneath it and hollowing out the earth from beneath, which they pushed up in a ridge all round the bird; then they dragged at the bird's feathers from below, to pull it into the grave. The male beetle then drove away the female. It is a curious thing that the burying beetle, after the first and easiest work is over, will not allow his wife to have anything more to do with the digging; seeming to prefer that she should sit upon the body and look on, or else fly to a distance. Having requested his partner to withdraw, the male went on working alone for five hours;

using his head as a spade, shoving and butting the earth with it as well as burrowing. He lifted up the bird, changed its place, turned it and arranged it in the grave; and from time to time came out of the hole, mounted upon it, and trod it under foot; then went below again and tugged it downwards. At length, as if quite worn out by this hard labour, it came forth, and leaned its head upon the earth beside the bird, without the smallest motion, as if to rest itself, for a full hour: just as a chief mourner might pause by a grave-side; after which it crept under the earth.

The next morning the bird was an inch and a half under ground, and thus it was allowed to remain for the whole day, as if it were laid out upon a bier—with a sort of earthen bank or ridge all round it.

Thus the pretty dead linnet lay in state until the evening, when it sank half an inch lower, and in another day its burial was over—it was covered with earth. I wonder whether when it was singing among the green leaves it ever guessed that it would have so careful a funeral?

In fifty days the naturalist found that his four beetles had buried twelve carcasses in the little plot of earth he had given them as a cemetery: four frogs, three small birds, two fishes, one mole, and two grasshoppers; besides some scraps of raw meat and entrails of animals. This shows what we owe to the sexton beetles, and how much they do towards ridding the earth of all sorts of animal refuse, besides burying dead bodies whole.

Now, why did these hardworking, steady, painstaking beetles do all this? If they had wished to feed on the flesh—if they had been thinking of their own desires only—they could have eaten it quite as well as it lay. The body

of one mole would have lasted for several days, and there would have been no need to put by more.

For themselves they need not have undergone the fatigue of putting the food underground; but it is plain that in all this labour they had the good of their young at heart. It was for their children that they toiled, in order to make a larder for them where the meat could neither be stolen, dried up, nor rained upon.

When the sexton beetle scents afar off some putrifying body, he takes wing towards it at once, with the view of preparing it for his family. These creatures hunt in couples; but the male, as a gentleman ought, does all the hard work; while the lady attends to her lighter duties, and has nothing to do but allow herself to be buried with the body, which she does, in order that she may lay her eggs in it so soon as it is safely below; and then, after a hearty meal in which her husband partakes, she creeps out again.

The common sexton beetle is about an inch long, and black. But there are many others with the same, or nearly the same habits, which are more gaily coloured. It is impossible to say how useful these creatures and their kin are to us; crowding as they do to every rubbish heap where people have carelessly thrown away refuse which would breed fevers if allowed to fester there, tainting the air.

The cocktail beetle is one of the most useful, for it will venture very near dwellings, and being such a plucky fellow that he will show fight in the most comical and amusing way if you try to turn him out. "Come on!" he seems to say, "I've got as good a right to the place as you—and better too, for I am at work and you are not."

The cockroach is another first-rate scavenger, and though

we dislike having him in our kitchens and outhouses, we should find the diseases which would arise still more unpleasant, if this insect were not, like the despised rat, constantly engaged in clearing away filth.

It is not, properly speaking, a true beetle, though very like one; and an amusing story is told of a naturalist who laughed at his friend for calling them so. "In the first place," he said, "they are not black, and they are not beetles," and then he pointed out that *cockroach* and not blackbeetle was the proper name.

"Oh well—for the matter of that, they are not cocks and they are not roaches," replied the other.

This insect, more like a sort of cricket in reality than a beetle, is a great enemy to the common bed-bug; and is found most useful on board ship, as well as in dirty houses, in clearing them of this scourge. When the cockroach appears, the bug disappears; and good prices are paid by sailors for the creature to be used as the executioner of the smaller and worse foe. "We have not taken animals enough into alliance with us," says a great writer; "the more spiders there were in a stable the less the horses would suffer from flies; the great American fire-fly ought to be imported into Spain to catch mosquitos; in hot countries a reward should be offered to the man who can discover what insects feed upon fleas." Thus, throughout God's creation the higher animals, even man himself, cannot be independent of the lower; and the head cannot say to the feet, "I have no need of you." Even the lowly cricket or beetle crawling in the dust serves lordly man and glorifies his God.

Besides the beetles which actually bury dead bodies there are enormous numbers which help to rid the earth of other impurities; substances that in their natural state would en-

cumber the earth instead of enriching it. They dispose of the droppings of animals; or rather prepare the manure for plants and offer it to their roots in such a form as they are able to use.

Hosts of beetles are constantly employed, with the aid of flies, in turning the masses of cow-dung and other manures into nourishment for the grass and crops; while at the same time they are using it as food for themselves and for their young.

One common kind of dor beetle or "clock," which may be seen on any summer evening, either drowsily flying or heavily creeping on the ground, has this habit.

It digs a deep round hole and lays an egg in it, burying with the egg a small quantity of manure, on which the grub is to feed when hatched. It sinks one after another of these dry wells, dropping an egg into each, until the whole number is laid, thus burying a number of small portions of the cow-dung in various places, and helping to spread it abroad as a husbandman would. The juices are taken up by the roots of plants and thus help to fertilise the soil.

A beetle with a very long name (*ateuchus pilularius*) makes little balls or pills of dung, placing an egg in the middle of each while the dung is moist. It then leaves these pellets in the sun for a few hours to dry, and in the meantime digs a hole, perhaps as deep as three feet. It then goes again to fetch the egg-ball, and rolls it along backwards with its hind legs till it falls into the hole, when the beetle covers it up.

Sometimes the beetle will find himself in great difficulties while pushing his ball over rough ground where it sticks in the cracks, or after being pushed up the steep side of a

little furrow, persists in rolling down again. These patient little creatures do not give the matter up, but generally go on till they have succeeded, though they may sometimes be seen tumbling head over heels, egg and all.

But when a beetle, after many trials, finds the task quite beyond his strength, he goes away and fetches a friend to help him. A German artist once saw a dung-beetle trying to roll a pellet which was too heavy for him. After trying in vain for a long time, it stalked solemnly off to a neighbouring heap and fetched three of its companions. All four set to work with united strength, and at last succeeded in pushing the ball, which contained the precious egg, into the hole prepared for it. Then the three kind neighbours went home again to attend to their own business.

Another gentleman being one day in a field noticed on a mound of fresh earth, probably a mole-hill, a striped black and red beetle with long legs, which seemed to be very busy taking away the earth from a hole which appeared to lead into the mound. After looking on for a while he saw a second beetle of the same sort, which, from inside, brought a little lump of earth and then disappeared again into the mound. Every four or five minutes a pellet came out of the hole and was carried away by the first beetle.

After working together in this way for about half an hour, the beetle which had been toiling underground came out and ran to its comrade. The two put their heads together and clearly held a conversation, for immediately afterwards they changed work. The beetle which had been working outside went underground; while the other took the out-door labour, and all went on as before. Seemingly these small insects could understand each other as if they had been little men.

Another beetle, of a shining golden colour, was also seen to go and fetch help to carry off a cockchafer which was lying dead on its back, and which it was unable to move alone. And as a fourth proof of intelligence, a beetle was once observed burying a caterpillar in a little grave which it had scooped out. After leaving this open, while it flew away for a few minutes, it came back with a little pebble which it fitted neatly into the hole like a small grave-stone.

In the preparation of patches of cow-dung the beetles are greatly helped by flies, which attack it immediately while still almost liquid. There is a kind of dung-fly the eggs of which are furnished with two oars apiece, to keep them afloat, preventing them from sinking. In time a mass of dung is completely honey-combed by the grubs which are hatched from these eggs, thus kept up so that the sun's rays may fall on them ; and they creep through the dung and feed on it as it hardens on the ground. The tunnels which they make through the mass will allow the air to pass through it as if it were a sponge; this prevents bad and poisonous gases and unpleasant smells, which would taint the air and make it unfit for men and animals to breathe, from arising. It also allows the rain to carry away the moisture from it into the ground, where it feeds the grass roots.

When it is thus partly dried and prepared for their use, the beetles step in and bury portions of it, feeding upon the rest. Their legs, jaws, and horny covering are exactly suited to the places in which they dwell, and are contrived so as to throw off all unclean stains. Though living and working amid decay and impurity, they are themselves always shining and clean. It is astonishing to see a beetle creep from a dung heap glittering like a jewel, clad like

some brave knight of old in gleaming armour—breastplate, backpiece, greaves, buckler, and even helmet, all of which he contrives to keep in a high state of polish without any esquire to help him in rubbing up his arms till they glitter with golden, silvery, or steel-blue lustre.

And the beetle is like a knight in more ways than one; he is always fighting valiantly, armed thus from head to foot, against a great enemy far stronger than he. There can be no worse foes to man, to animals, to the world, than those two great giants, *Dirt* and *Disease,* and against these the beetle, in his small, humble way, wages war all through his little life, keeping clean himself all the while.

The only thing which will cling to the coat of a beetle is clay; and when he works through that, at boring holes for his eggs, he comes out of the burrows quite bedaubed with it. But shall we blame the beetle for the marks of honest, unselfish toil which he is sometimes forced to carry on his clothes?

Do you blame the dustman for being dusty, or call the chimney-sweep names because he has a black face? No; we ought to feel much obliged to those men who spend their lives in taking away our refuse. It cannot be pleasant work, and we should respect and honour them in spite of their grimy looks. We should not like to have the task laid on our own shoulders, or so be despised for doing the work if it were our own fate.

And in the same way we ought to regard the tiny scavengers sent by God into the world, which are always toiling for our good; and to take care that, at least, if they get no thanks or pay, they shall at least receive neither ill-treatment nor contempt at our hands.

As I went treading a miry way
All lonely and lorn one sultry day,
I met with a gay knight clad in blue,
And his armour glinted a steely hue.
"What ho! Sir Knight,
In your war-like plight,
Whither away,—and what foe to fight?"

Quoth the knight as he slowly wended along,
"Oh, the trouble I've had these ruts among!
Where the cart-wheels go, all sadly and slow
I've been rolling my ball, and it tumbles so!
There's an egg inside,
Just laid by my bride,
And forth I must trundle it far and wide.

"We knights are sworn our ladies to heed,
And care for the helpless in time of need;
And fight the great giants both Dirt and Disease,
Instead of expecting to do as we please."
"All hail! all hail!
To your coat of mail,
True knight, Sir Beetle, may you prevail!"

## QUESTIONS.

Q. 1. In what way do sexton beetles work?

A. They bury bodies of small birds and animals.

Q. 2. How do they manage this?

A. By scooping out the earth beneath till the corpse sinks.

Q. 3. What idea has the sexton or burying beetle in doing this?

A. The wish to provide for its young.

Q. 4. Does the female work as well as the male?

A. No; she merely lays the eggs in the body after it is buried.

Q. 5. What would happen if there were no sexton beetles?

A. The ground would be covered with dead bodies of creatures, and the air filled with bad smells.

Q. 6. What other beetle is very helpful?

A. The dor or clock.

Q. 7. How does this creature work?

A. It buries small portions of manure which brings it to the roots of plants.

Q. 8. Are beetles clever creatures?

A. Yes; they show intelligence not only by their work, but by being able to ask help from one another.

Q. 9. Name a beetle which is very useful near houses.

A. The cocktail beetle, which eats refuse.

Q. 10. Is the cockroach useful too?

A. Yes; in dirty places.

Q. 11. How is the cockroach useful?

A. It eats bugs, and acts as a scavenger.

Q. 12. Are beetles clean creatures?

A. Yes; they always manage to keep themselves clean and shining wherever they may live.

# Spiders.

"A spider's web blocks all my avenue;
He catches down and painted foolish flies,
That spider wary and wise.
Each morn it hangs a rainbow strung with dew
Between boughs green with sap,
So fair, few creatures guess it is a trap:
I will not mar the web,
Though sad am I to see the small lives ebb."

—*Christina Rosetti.*

WOULD it not be a most extraordinary thing if a cat were to be seen spreading a net to catch birds and mice in with threads which she drew from her own body? Would not crowds of people flock to watch her?

The world would certainly think a great deal of such an animal, and she would have a host of admirers; and yet there is a creature which does this very thing—catching its prey by means of a snare; but few people pay heed to its quaint and curious devices, or to the shrewd way in which it sets to work.

The nets or webs of spiders are to be seen everywhere; it is because they are so common that but little attention is paid to the matter; if it were rare, the sight of a spider spinning would draw hundreds of eager spectators to the spot.

On every bush, grass-stem, and hedgerow, the silken lines of the spider are spread, and when glistening with dew, are among the most lovely things upon which the eye can rest, being far more exquisite than the finest lace and diamonds.

Spiders' webs are to be found in our houses too, though there they do not look so pretty because of dust. All over the earth, as well as in our own country, spiders are to be found, varying in size from that of a small mouse to a speck no larger than a grain of sand.

One kind lives in the water, and weaves a sort of diving bell, which it contrives to fill with air by drawing down bubbles into the net; another makes a little raft of leaves and sticks on which it floats, catching water-insects for its food. Again, some of these little beings seem able to fly without wings, for they are found by the swallow at a great height in the air, floating on long streamers of slender thread which bear them up.

The silken fly-traps of the spider are of many kinds, but the commonest two sorts which we are likely to see on an autumn morning are the round webs, shaped like a wheel, and a sort of flat net, slung across from stem to stem, or from one twig to another as a fairy hammock might be.

This flat net is a very simple arrangement, being only a sort of roughly woven tangle like gauze, which the spider spins across and across, the threads all going different ways and interweaving. Up above are a few lines farther apart from each other, like a sort of loosely-made roof. A stray fly settles on these upper threads, or blunders in among them unawares, and instantly entangles his wings. In trying to break loose, he is almost certain to drop down farther and farther, becoming more and more puzzled and tired, till at last he drops down into the net, worn out by his struggles.

Under the snare spread out to catch him, or near it, the master of the den is hiding; taking care to keep out of sight, while he knows all that is going on in the trap by

means of a thread stretched from it to his lurking-place. Upon this kind of telegraph wire he keeps one foot, so as to be able to feel the least shaking in the net, and to pounce out at once.

The other web, wheel-shaped, is a more carefully-made piece of work. The largest of our English spiders which forms a trap of this kind is the common garden spider, sometimes called the diadem or geometric spider.

He begins his task by laying the long threads first, which are like the spokes of the wheel, and which all meet in or near to the middle. He next joins these together by a thread which goes round and round, working from the centre outwards, and very quickly. He gives a pull to the threads now and then, to see if they are strong enough before he fastens others across, and should one snap, he replaces it by another. Last of all, the little weaver spins another set of circles round and round his web, this time making use of a different sort of thread, which is covered with tiny drops of sticky, gummy fluid. This last thread is meant to catch the flies, and to prevent them from getting away when once their legs and wings touch it.

The diadem, garden, or geometric spider, when he has finished his wheel-like web, generally sits in a little parlour in the middle to wait for his dinner while he holds on with his six legs, each of which has the tiniest possible hooks or claws at the end, which keep him steady or help him to run and climb about his web as safely and easily as any rope-dancer could do on a thick cord.

A very fine, handsome fellow he is—dressed in a golden-brown velvet coat which looks as if it were trimmed with little pearls. If you look at him closely you will see that, unlike the wasp, bee, or fly, his body is made in two pieces

instead of three. Instead of having a head, a thorax or middle part, and a tail or abdomen, he has only the middle part or thorax and the abdomen. Strictly speaking, the spider has no head!

His body is very soft and defenceless, his legs will drop off at a slight blow; so, as he is not strong, and is not dressed in armour like a beetle, he needs some help towards taking care of himself. Therefore the skill to make a trap has been given him, as well as very swift powers of running away, and wit to make a cunning, harmless pretence of being dead, which sometimes saves his life when he cannot otherwise escape the sharp eyes of some bird. Few birds will eat an insect which they think to be dead. Besides these shifts he is armed with poison-claws, which not only assist him to stun and kill his prey at once, but are a means of defence when he is attacked by larger insects such as the wasp. Spiders never allow their victims to die a lingering death, but kill them quickly by plunging the poison-claws into the body at once; and, strange to say, though the poison is fatal to the fly, it is quite harmless to the spider which eats the carcass.

The way in which the web is drawn out from the spider's tail is most interesting. There are four little, round warts at the end of the abdomen, each something like the rose of a tiny watering-pot. These are called spinnerets, and are pierced with an innumerable quantity of small holes

Through these the spider squeezes, from within his body, a gummy juice, which, the moment it passes into the air, hardens into the finest possible threads of silk, not unlike those of the silk-worm. From each of the four spinnerets many thousands of threads are drawn, so thin and delicate

that our eyes cannot see them until masses of them are twisted together.

The threads of each spinneret join into one, and then the four threads are twisted together by the help of one of the spider's hind claws, forming a single rope of four strands, each strand consisting of thousands, perhaps millions of lines so fine that they would not bear a touch or a breath.

We are accustomed to speak of the finished thread of a spider's web as being the finest one we can imagine;—but could any fingers be found small and delicate enough for the task, each of these threads could be ravelled out first into four, and next each one of the four into millions!

Though the spider has no true head, he has branched feelers at that end of his body where the head ought to be, and a pair of eyes, each of which is made up of eight small ones.

The claws are not alike in all spiders. Some have two sharp claws to climb by and a knobbed one in between, which is to help them in rolling up the web thread into a ball, as they do when running up to the ceiling, or to the bough of a tree, after letting themselves down. Others, which need the silk in broad bands for lining a nest, have a sort of comb in the claw which keeps the threads apart and prevents them from joining into a round rope.

The spider uses silk for many purposes; among others for making a round bag or ball like a cocoon, in which the mother spider lays her eggs. But how does she contrive to get her eggs into the ball, which has no break in it?

This seems quite a mystery until one learns how the spider can manage. The mother first chooses some sheltered corner, beneath a stone or in a window-frame in some empty place where no one comes. Then she weaves a kind of plat-

form to hold her steady, and bear her weight as well as that of the eggs. Next she gradually begins to make the cloud of threads which she is weaving into the form of a cup, using her body in shaping it, by getting inside and pressing herself against the sides, turning round and round as a bird does when she is fashioning her nest into a circle by means of her breast. When a little bowl or cup is thus made quite neatly she lays her eggs in it,—there is now a little cupful of white bead-like shining things ready to be covered over. This she does by roofing them in with a silken tent atop, a kind of lid, till a complete ball is strongly and tightly woven. In the spring baby spiders come out, just like grown-up ones, only small, and are soon able to spin little perfect webs of the size of a penny piece without being taught.

Some spiders live in burrows under ground, and may be seen, should their home be accidentally disturbed, anxiously snatching up the egg-bag as if it were the only thing in the world worth thinking about, and hurrying away to place it in safety.

A mother spider, carrying her egg-bag, was once seen to fall into the pit of an ant-lion, a curious insect which digs a little pit of loose sand and hides itself at the bottom till an ant or beetle slips down the sides into its jaws.

As soon as the spider found herself in the pit she tried to run away with the eggs, but was not quick enough to prevent the ant-lion from seizing hold of her bag, and trying to draw it under the sand. The affectionate and faithful mother never made a second attempt to escape, but forgetful of herself, bravely stayed in the pit, struggling with the ant-lion for her babes in the bag. She fought, she tugged, she pulled and dragged violently, holding on to her treasure with might and main; but all was useless. The ant-lion was stronger

than she, and at length succeeded in possessing himself of the eggs and drawing them beneath the sand.

In compassion for this courageous and plucky mother, the naturalist who watched the scene tried to rescue her, pushing her from the spot over and over again with a twig; but she always returned to the place where her buried children had disappeared, seeming as if life had no longer any pleasures for her, and preferring to be buried alive rather than to leave the spot where she had seen the last of her dearest possession.

Spiders have the power of shooting out their threads to a length of several feet; the line thus sent forth floats till it touches a branch, wall or post, where it is made fast by a sticky substance which glues the end firmly, thus forming an airy bridge, which the spider at once crosses, generally after having given it a sharp pull to test the strength, and always carrying with him a *second* line, joined to the spot he left, that he may have some holdfast in case of accidents. They have been known to affix small weights, such as a bit of stick or stone to the lower strands of a web, to balance and keep it steady in a high wind.

The enormous number of flies which are cleared by spiders from the leaves of trees and plants, as well as from the air we breathe, would be quite beyond human power to reckon. Without spiders, we should probably have plagues of gnats and winged insects of all kinds, in spite of the birds. They have in their turn many enemies to prevent them from increasing too much. In stables and outhouses, as well as in rooms, they are very useful; not one spider should ever be killed in any of these places. Without the race, this world would be a far less pleasant place than it is, even if it were habitable at all.

The industrious clever spider will teach us a lesson of patience, of painstaking skill, and of brave affection.

It was to draw our attention to this perhaps that the Bible says, "The spider taketh hold with her hands and is in kings' palaces." And although some wise people have thought that these words were spoken not of the common spider but of his cousin the scorpion, there is no reason for despising the idea that they may mean us to observe and take pattern by our familiar English spiders too. The wisest and greatest man who ever lived—whether prince, peasant, artist or simple artizan, need not be ashamed to take pattern by the perfect workmanship, as well as the painstaking patience, of this humble being.

The skilful spider spreading silken snares
Waylays his captive, swiftly, unawares.

In palaces of kings he doth not dread
To weave with noiseless shuttle overhead.

And finest lace of queen upon her throne
A coarse-spun web would seem beside his own.

Marvel of workmanship without, within,
Choose but my dwelling there to toil and spin !

Welcome as flowers (which by their blossoms preach),
The sermon that thine industry doth teach !

The helpless, not the idle, God will feed ;
And such may wait on Him in time of need ;

Not so the folk who honest labour shirk,
Neither should any eat who will not work.

## QUESTIONS.

Q. 1. What is the largest of common English spiders ?
A. The garden, geometric, or diadem spider.

Q. 2. How does he spin his web?

A. In the form of a wheel.

Q. 3. How does the spider procure his thread?

A. He draws it from the spinnerets in his tail.

Q. 4. How many spinnerets has the spider?

A. Four.

Q. 5. How does the garden spider begin his wheel-shaped web?

A. He spins the long threads which meet in the centre first, and then those which go round and round.

Q. 6. What does he do last of all?

A. He draws out a sticky thread covered with little beads of a sort of glue, and fastens it round and round.

Q. 7. What is the sticky thread for?

A. To entangle the wings or legs of flies.

Q. 8. What sort of feet has the spider?

A. Tiny claws which help him to walk on his web or hang from a thread by them.

Q. 9. How does the spider kill a fly?

A. He benumbs and kills it with the poison in his claws.

Q. 10. What other kind of spider is very common here?

A. One which weaves a sort of net and lies in wait beneath it.

Q. 11. Are spiders useful?

A. Yes, very, in keeping down the number of flies.

Q. 12. Are they harmless?

A. Perfectly so to human beings.

# Ladybirds.

"The aphis feeds nor finds his leaf
Untenable because a lance-thrust, nay,
Lightning strikes sere a moss-patch close beside
Where certain other aphids live and love."

—*Robert Browning.*

No one who has had to do with plants either in pots, greenhouses, or garden beds, can have failed to notice how much mischief is sometimes done to their favourites by quantities of very small sluggish insects which cling to the leaves and stems.

These are sometimes so tiny as to look like grains of coal-dust, but they are not always black; oftener they are of the same colour as the plant itself, which makes them very difficult to find, or they are lilac, yellow, or grey, instead of being green.

Currant bushes, vines, apple trees, almost every kind of plant, shrub, and tree is to be seen covered with these minute living things;—very thickly now and then; and wherever they cluster or hide themselves they make the plant upon which they gather look sickly, its leaves becoming twisted or crumpled, its stems dwarfed and crooked, its blossoms wretched and deformed; in short, it is *blighted.*

The small insect which does all this mischief to plants and trees is called the *aphis* or blight, and sometimes people name it the "green-fly," because at one time of life some of

these little things are winged, and the commonest colour for them is green.

The work of these creatures, for they have an office and a use, is to keep in check the over-growth of trees and plants in places where no human foot treads, no gardener or woodman comes with axe or shears. There are many lands where the forests, herbage, and vegetable growth of all kinds is so rapid and becomes so dense that it would in time be far too thick for health either to the plants themselves, which would not thrive so crowded together, or to the animals which lived among them. There are many beings of the insect tribe whose office it is to prune, thin, cut, and keep in order the plants and trees; among these the blights take their place.

It is from foreign countries that most of the kinds of aphis or blight have been brought into this island, where of course they are not wanted, because it is everywhere under cultivation without their help. Almost all our fruit trees, the vine, the peach, the pear, besides a host of other trees, were brought from abroad, and new plants are still constantly being imported, among the leaves of which eggs arrive, or else perfect specimens of new varieties of blight, to become a troublesome plague.

There are two ways in which blights are harmful to plants; firstly, they suck out the sap or juice from the tender shoots by means of a sort of sharp, hollow beak which they stick into the plant. This weakens the shrub, tree, or bush as much, by degrees, as it would weaken an animal to draw out its blood; taking it away by little and little. Secondly, they spoil the leaves by sending out from their own bodies a sweet, sticky juice, called honey-dew, which clogs the small pores or holes with which the leaf is

covered, and by which the plant draws in moisture as well as air. This stopping up of the pores or small holes on the surface of a leaf does as much mischief in time to a tree as would be done to a fish, bird, or beast by choking up its gills or lungs so that it could not breathe.

Ants, wasps, flies, and other insects do much good to blighted plants by cleaning them of this juice, of which they are very fond; and birds do even more good by eating numbers of the blights which cause it; but there is one small beetle which does more for us than any other creature in this way, and that is the pretty little ladybird or ladycow.

Everybody knows the gay, little, scarlet-coated fellow with his black spots and white specks on the head; he would be a favourite anywhere for his good looks; but he is better than some handsome folk who are idle and useless—he is both beautiful and useful. He seems to have been born on purpose to help man against the terrible misfortunes which might fall on them if the vast companies of blights had things all their own way. We cannot tell how much the ladybird does for us, unless we think for a moment what harm this huge army of enemies might do if there were nothing to thin their numbers.

There is no doubt that if they were allowed to go on quite undisturbed they would soon make the world quite unfit for men and animals to live in. The female blight does not lay eggs, but produces about fifteen or twenty young ones just like herself, only smaller, born every day for about six weeks. That is, for six weeks she goes on multiplying herself by twenty every day. Each of these young ones, growing quickly and changing its skin three or four times, begins to have children of its own at the end of

a few days. So you may fancy how fast a plant might be covered with blights after a solitary one had crawled upon its stem.

If no plan had been made by the Creator for keeping these creatures in check they would soon overpower every green thing, and men would be quite helpless to prevent the ruin caused by things so small, yet so numerous.

A wise man, clever at doing sums, once found that one blight alone, if allowed to multiply without disturbance, would, by means of the young which it produced and their descendants, be able to ruin the world: taking only three hundred days (less than a year) to choke up its whole surface, land and water alike, so that no other creature could exist upon it.

But the good God has sent us, besides the birds and other small beings which prey on this tiny but most dangerous foe, a creature which is fully able to do the important business of keeping down the enormous numbers of blights. The French gratefully call the ladybirds "Vaches à Dieu," or "God's cows," because of this great work which they do. The quantity of ladybirds born each year is regulated in a wonderful way by the numbers of blights; that is, in summers when there are many blights there are also many ladybirds, but when the blights are fewer, the ladybirds are fewer also.

The ladybird, before she dies, lays her eggs on a plant where she notices blights to be, in order that her little ones, or larvæ, when they are hatched, may find plenty of food close by. The young do not all live to grow up if there are not blights enough to feed upon, but if there are plenty of blights the whole brood rears itself; it may be thus that things are kept even, and that there are never too

many ladybirds; or, perhaps, like the ichneumar fly, the ladybird may have the power of judging how much food her future young will need, and of laying just as many eggs as the supply will nourish.

The hop plant, one of the most valuable things grown in England, is very subject to a kind of blight, and it is on these hop plants that the tiny yellow eggs of the ladybird are most commonly to be found.

From the egg a small grey grub creeps, not unlike a very minute fat lizard, marked with red and yellow, and begins at once to feed upon the blights which it finds around. Of these it will devour as many as forty in an hour; it is able to kill all the more because it does not eat the whole of the blight, but only a small part of each one, throwing away the rest. Thus it lives till full grown, when after spending a short time hung up by the tail, as a little chrysalis, it changes into a perfect ladybird, and begins again to kill blights for its food at the rate of from thirty to a hundred in an hour, according to size.

We can easily understand how glad the hop-grower must be to see thousands of these good little creatures swarming to settle upon his hop-vines in seasons when the blight is plentiful; and it is no wonder that he is pleased to pay boys for driving away the birds which flock thither to eat his little helpers.

In 1807 the people at Brighton and all along the southern coast were surprised and a little alarmed at seeing the whole country side covered with quantities of these little scarlet beetles,—in some places so thickly that it was impossible to set foot on the ground without treading on many at a time. But they soon found out that the swarms were on their way from the great hop gardens of Kent, where they had been

busily at work, to some other place where there were other labours for them. The blights that year would most likely have destroyed the whole yield of hops, had the ladybirds not interfered to prevent the entire ruin of the precious green clusters, so valuable that they are called "brewers' diamonds." Had they failed on account of blight, an immense loss would have fallen on the country.

It is no wonder that everyone should admire and love the charming little ladycow, and give it a welcome whenever it comes. It is always busied in doing good, and it never does any harm, for even the strong oily smell which comes from it is said to be a cure for toothache.

If you let one of those little things crawl upon your hand you will be able to notice this smell, and also to see how exquisitely the tiny thing is marked, painted and formed.

In warm weather it is very active, and will seem anxious to fly away from you, but in winter it will be glad of the shelter of a sunny window, and will perhaps live till spring if allowed to stay there, while out of doors its companions die.

If on your hand, it seems unable to fly unless it is allowed to creep up your finger; it is not easy for it to rise from a flat surface. But if you let it run up to the tip, it prepares to take wing at once. Then you will see a split which seems to crack its back into two parts down the middle; it will raise the two halves which are merely joined on at the shoulder, and are the wing-cases to protect the filmy wings which it next stretches out from beneath them, where they were folded neatly under the two pretty little shell-like shields. The happy, brilliant little being will float away into the sunlight to be gay and glad, as well as to carry out the work for which it was made.

My name is ladycow, the children's pet,
I am a coral gem, be-dropped with jet,
With silver wings beneath their coverts set.

I browse on creatures scarcely half alive,
Which yet can feed, and multiply, and thrive,
As grows the grass that cannot toil or strive.

Left unmolested, silent, sure, and slow,
Would their vast, countless numbers overflow
Like some great ocean wave, all things that grow.

And therefore do I toil, and never tire
Slaying my thousands, sating my desire
Of food ; God stints no workman of his hire.

So let me come and go, and take my fill,
Of things that scarcely suffer as I kill ;
I am a messenger to work His Will.

## QUESTIONS.

Q. 1. What is the food of the ladybird?

A. It feeds on the aphis or blight.

Q. 2. What is the office of the blight?

A. It prevents the overgrowth of plants in countries where they flourish too freely.

Q. 3. Are blights wanted in England?

A. Not so much, because all the land is cultivated more or less.

Q. 4. How did blights come to be here then?

A. They were chiefly brought from abroad on the leaves of plants and trees.

Q. 5. If blights were allowed to increase without being disturbed, what would happen?

A. They would choke up the whole earth, and destroy every living thing.

Q. 6. How does the green-fly or aphis feed?

A. By pushing a sort of beak into the tender stalk of a plant, and sucking out its juices.

Q. 7. What other harm do aphides or blights do?

A. They clog the leaves of stems and plants with a sweet, sticky juice called "honey-dew."

Q. 8. What valuable plant is particularly subject to the attacks of a kind of blight?

A. The hop plant.

Q. 9. How many blights will a ladybird grub eat in an hour?

A. About forty.

Q. 10. Does the full-grown ladybird grub eat blights too?

A. Yes, from thirty to one hundred in an hour.

Q. 11. How long did a clever man find that it would take for a single aphis, with its young, to destroy the world?

A. Three hundred days.

Q. 12. Where does the ladybird lay its eggs?

A. Among the blights.

# The Wasp.

"Creation
Revealed me no object, from insect to man,
But bore Thy hand's impress."
—*R. Browning.*

On a warm, sunny spring morning a large wasp may sometimes be seen flying over the ground somewhat drowsily, for she has just awaked from her long winter sleep, being the last perhaps of a large nestfull which were all killed by the cold. She has escaped, having hidden herself perhaps beneath a sheet of moss, the kindly shelter of which saved her life, and whither she crept half-benumbed in the autumn, or else she lingered through the bitter frosts in the old nest, empty except for her lonely presence there.

This is a mother-wasp, or queen-wasp, and she is now setting to work, though still feeling rather weak and chilled after her nap of several months long.

And what is the labour which she wishes to begin? If you watch you will see that she is taking a long time and a good deal of care to choose a place in the hedge-bank where the earth will suit her, being loose and easy to dig; or if possible she will use an empty field-mouse's hole ready-made for her nest. More often, however, she will settle in the ground, and begin to dig a long burrow large enough to allow of her running in and out easily. At the end of this she will scoop out a little cave, and carrying off the earth, throw it outside the hole. As she does not begin her inner-

chamber until she has finished the passage for some depth, it gives her a great and toilsome piece of work indeed to clear it out, and she labours so earnestly at it that she will take no notice of you if you stoop down to watch her.

So soon as the little cave is finished to her liking, she flies off to the nearest tree stump, gate-post, or railing, which is partly rotten, and where the wood may be easily scraped away. Here she files and rubs and grinds with her jaws until she has collected quite a large pinch of the powdered wood, which she mixes into a paste with some gummy juice from her mouth—treading it, kneading it, and finally carrying it off to her little cave, where she spreads it out into thin layers of what looks like thin sheets of brown paper. With these she forms a small comb, like that of a bee, only made of paper instead of wax. She roofs the cells in with paper several layers thick, so that if the rain should come through the outer covering it would leave the inner ones dry. She also forms pillars to keep the comb steady and prevent it from falling down. When a few of the cells are finished she lays eggs in them—one egg in each—which she takes care to glue to the side of the cell with the same sticky liquid from her mouth, for fear that it might fall out, the opening of the cell being downwards.

She then goes on making more cells in another comb which she builds beneath the first, and while she is working at this, the eggs in the first comb are hatched. At first the mother feeds them, as they cannot leave the cell, with food from her own mouth, as a pigeon or dove feeds its nestlings—putting her head into each cell by turns, and giving a morsel to each little occupant.

After a while, however, the grubs begin to pop their heads out of the comb and to look about for more solid victuals; busily then the affectionate mother now roams backwards and forwards in search of what they need.

Quickly she goes to and fro catching flies, spiders, caterpillars, anything of the sort which she can get, and carefully she cuts them up into small pieces for her children; or she will fetch scraps of meat, or whatever comes in her way, bringing it from the nearest places, so as not to keep her young waiting. I am sure that you will not grudge the brave, hard-working mother a little taste of your pear or plum, or a tiny nibble at your cake, when you know that, instead of wanting it all for herself, she is going to carry it home to her babies. It would be cowardly, indeed, to worry or hinder her, working all alone as she is to take care of her feeble young. She shows all that hurry and bustle because she is anxious to get back to them—she remembers that they are waiting for a meal in the snug, beautiful home she has dug out and built for them with so much pains and trouble, at the bottom of the little hole in the bank.

Soon the grubs grow large enough to fill up their cells quite full, each one his own; and then they spin some silk across the opening, go to sleep inside, and soon change into full-grown worker-wasps when they wake up. Twelve hours after they come out, having bitten a way through the silken door of the cell, they are as large as they ever will be, and have quite done with changes. They are now ready to begin, not a life of idle pleasure, but one of unselfish industry. They at once relieve the patient queen-mother of all the toil and trouble, and repay her by setting to work as hard as possible to enlarge the nest, which they

do by digging out more earth, making new combs joined to the old by other pillars, and lying one beneath another like the storeys of a house, the whole being made out of the brown paper, which, for the supporting pillars, is formed into extra thick sheets, so as to bear the weight laid on them.

In a short time a great company of wasps, workers, males and females, are all living and toiling together in the same nest; for as the town or nest becomes larger, the queen lays eggs of all three sorts. They store up no food, because they either die or sleep when winter comes; but there is no lack of employment, for with the enlarged nest comes an increasing number of grubs, and consequently of mouths to feed. By midsummer the wasp's castle becomes a busy place indeed, for it may contain many thousands of inhabitants, all of which have their own wants, and those of their helpless offspring to attend to.

All through the spring and early summer wasps are of great service to the gardener by killing small caterpillars, flies, blight, and spiders which infest his fruit trees. In autumn, when the fruit which the wasps have helped to protect becomes very tempting to them, their useful services are forgotten, and nothing is noticed or remembered but their petty thefts among the peaches and plums. This is not quite fair.

Should the wasps destroy the fruit, those who wish to keep it perfect, and, at the same time, secure the help of the little golden-belted thieves in keeping off flies, and other harmful insects, can tie up choice wall-fruit, each pear, plum, or peach, in a little muslin bag; this is easily done.

All through the year till autumn, there is no doubt that wasps work unceasingly for *us*, as well as for their

young and themselves. Some folks are wise enough to know this, and to cease waging war upon them.

The year 1811 was remarkable for the small number of wasps; and it was supposed to be on account of their absence that the flies in that season became so plentiful as to be a serious nuisance.

In France the butchers are glad to welcome wasps, because they carry off the flesh-flies from their meat. The writer of a book called "Letters from America," says that in some parts of the United States, the nest of the hornet, a very large kind of wasp, is hung up in sitting-rooms, that the hornets may clear the air of flies, which they do without harming the people who occupy it.

Some silly people seem to fancy that when a stray wasp wanders by chance into their room, it is thinking about nothing but stinging everybody it meets; but the wasp is far too busy for that; it has its own business and duty to attend to, and will not harm anyone if left alone. Nothing is more absurd and foolish than the ridiculous fuss—the shrieking, running about, and flapping of pocket handkerchiefs, which these good folk will begin when they see a poor little wasp coming. If you wanted to make him sting you, that would be the right way to go to work; whereas, if you keep quiet, so will he. His sting was given him for a help in hunting his prey, and is a weapon of defence against other insects or larger creatures which attack him: he will use it when frightened or persecuted, not otherwise. If you leave the wasp alone, he will leave you alone, and be thankful if you will open the window, and let him go out; he wants to go home, and has plenty to call him there.

Sir John Lubbock found that wasps sting only when they feel timid; and he taught a wasp to sit on his finger, and

allow him to stroke it. The wasp never used his sting when he found that there was nothing to be afraid of, so you see if you are gentle to wasps, they will be the same to you.

Wasps have a great deal of sense; this shows itself not only by the way in which they make their nests, but also by their learning to know those who are good to them. They prove their cleverness, too, in many other ways.

Some one once picked up a fallen apple which had a little hole in it, and was full of wasps which were eating out the inside. The wasps when disturbed began to crawl out—but instead of coming out head first, which might have made it easy for an enemy to pounce on their most defenceless part, they all came out, one after another, *tail* foremost; each stopping at the edge of the hole to brandish its sting, as if to frighten away any foe which might be lying in wait.

They always fly in the straightest line they can to their hole, so as to cut the distance as short as possible: and once Sir John Lubbock's tame wasp, finding the window shut which led from the room where honey had been placed for her to her nest by the nearest way, wasted a good deal of time in buzzing against the glass, instead of going out by the other window which was open. He showed the wasp the way out by the further window four times as it paid its visits, and after the fourth lesson she found the way out herself, without bumping against the wrong window any more. This showed that the wasp had a mind, could think, and was able to remember: a power of learning these little things doubtless have, as well as a memory; although the latter does not last long.

A gentleman once watched a wasp which was collecting food for its young. It came to a leaf on which a small caterpillar was rolled up. Finding that it could not get at

the hidden spoil, the wasp bit a hole at one end of the wrapper, and going to the other end, made a noise which frightened the caterpillar out. The wasp then seized and killed it; but finding the prey too large to be carried away all at once, it cut the body in two, and bore off one half. In a short time it came back, and fetched the other half; so that it must have kept the prize in mind, and recollected the way back to the spot where it lay.

The sting of the wasp is a hollow tube, though it is sharp-pointed: when it is thrust into anything, a little drop of poison is pressed from out a tiny poison-bag at the root of the sting, which runs down the tube into the wound. This venom, though it feels painful to us when we are pricked by the wasp's sting, is a very merciful drug when the creature is killing flies, spiders, and grubs, for it appears to benumb them in a moment.

Although the wasp looks something like a tiny flying tiger, and seems fierce, it shows the love and tenderness of a dove towards its young all through the warm, pleasant summer-time. But when the first winter frosts begin, a change comes over its gentleness. You would hardly believe that these beautiful and devoted insects, which behave so lovingly to their offspring; caring for their nest and young as if they had nothing else to live for through the long days; could at last fall upon the little ones, drag them from their cradle-cells, and savagely kill them.

Yet this is what the wasps do!—only we must look in all the works of God to find mercy hidden somewhere; and we are sure to find it in the end, though we may have to search a long while—for we are not able to comprehend His great ways with our feeble sight at a first glance.

This slaughter of their young by the full-grown wasps is

all done out of a marvellous love and kindness towards them, as well as by a wonderful forethought and wisdom—so remarkable a thoughtfulness, indeed, that we could not believe it, did we not know it to be true.

These creatures know—or act as if they knew—that the terrible cold of winter is coming, which will bring death to themselves, or else a deep sleep, during which they will no longer be able to provide for the wants of their young. Thus, in order to save their children from dying slowly and miserably of hunger, cold, and want, they kill them quickly, mercifully, out of love, not hatred.

The creature which almost all men despise, thinking of it only as a harmful, cruel, troublesome intruder to be chased, killed, and crushed ;—its exquisite form mangled and ruthlessly destroyed ;—this outcast shows forth, by its deed, the care and tender mercy of the Great Creator over all His works—even where man most mistakes it. Faithful to the last in its care of the helpless beings which depend on its care, and which it loves, this tiny creature puts them beyond reach of suffering when it can no longer tend them ; and then, its last bit of life-work faithfully done, creeps silently into some hidden nook beneath a stone, under a ledge of withered fungus, between two overlapping layers of bark, where it falls into a sleep, usually its last, for few wasps live to see a second spring.

Golden wasp with rainbow wings,
Let me count your yellow rings ;
As you poise my fruit to taste
Lovely gleams your slender waist.

You are restless,—will not tarry ;
To your little ones must carry
Pleasant taste of mellow pear,
Welcome, then, with me to share !

For a mother is a mother,
Loves not self but loves another ;
Not to feed yourself you thieve,
Children's wants you must relieve.

Tiger-striped with dove-like heart,
Go in peace and do your part !
I'll not vex you, nor annoy,
Nor the work of God destroy.

## QUESTIONS.

Q. 1. What is the beginning of a wasp's nest?

A. It is begun by a solitary female wasp left from the year before.

Q. 2. How does she begin the nest ?

A. By scooping out a small cave underground.

Q. 3. How does she line the cave and form the comb ?

A. Out of wood-scrapings moistened with a sort of glue from her mouth.

Q. 4 What is this substance like ?

A. Something like thin brown paper.

Q. 5. What does the queen-wasp do when a few cells are finished ?

A. She lays eggs in them.

Q. 6. Which way do the cells open ?

A. They open downwards, so the wasp glues each egg firmly to the side that it may not fall out.

Q. 7. What happens next ?

A. The young grubs are hatched and the mother wasp begins to feed them, taking the food from her own mouth.

Q. 8 How does she feed them as they grow larger ?

A. With flies, spiders, caterpillars, or scraps of other food cut up small.

Q. 9. Are wasps the friends of the gardener?

A. Yes. They are of great use in clearing fruit trees of insects and grubs; choice fruit may be kept from their attacks by being tied up in muslin.

Q. 10. How do the wasps show kindness to their young when they can take care of them no longer?

A. They kill them quickly to save them from a lingering death.

Q. 11. What sort of weapon is a wasp's sting?

A. It is hollow and has a poison-bag at the root.

Q. 12. Of what use is it?

A. It is meant to help the wasp in killing its prey quickly and to defend it when attacked.

# The Earwig.

"He, out of nothing, made sky, earth, and sea,
And all that in them is—man, beast, bird, fish,
Down to this insect on my parapet.
Look how the marvel of a minim crawls!"

—*R. Browning.*

THERE are no creatures which show greater fondness for their young than insects; and this love is the more remarkable because, in most cases, the affectionate parents are never to see the children for whom they labour so earnestly.

Most insects die after laying their eggs; having first taken the greatest pains to place them on or near the food which is to supply the little beings so soon as they are hatched.

But some few of the tribe are permitted to enjoy the delight of tending their offspring; and in particular the lowly earwig; a creature so much wronged and misunderstood; yet which is a model mother, feeding, rearing and sheltering her young ones with as much tenderness as if she were a hen, and they her beloved chicks.

This much-scorned insect is among the commonest of persecuted things; you may see it any day hurrying away if you lift up the stone beneath which it has sheltered itself; or you may notice how eagerly it runs off to hide again, should it be shaken from between the petals of some dahlia blossom, rose or sunflower, where it has been trying to keep out of sight.

It is a creature that likes to lie quiet by day and to come

forth by night; when it is found lurking beneath a flower-pot or in any other hole or corner, it is seeking safety from its enemies,—for it has many—as well as finding rest from the glare of daylight which dazzles it.

When found out, the earwig runs in that anxious, rapid way because it is in trouble; plainly feeling that it is in danger, whenever seen, for hardly anyone is its friend.

The robin, the wren, the sparrow, the tit, all lie in wait for it with their sharp beaks; both the hedgehog and the toad look on it as a dainty tit-bit. Besides all these foes it has the gardener to dread, who hates the earwig, and will kill it whenever he has a chance. Why? Because it sometimes takes a nibble at his carnation blooms or a bite or two from his choice pansies.

But before condemning this insect and giving it a bad name, it would be better if those who have gardens would take the trouble to find out what its habits really are; for as a matter of fact it is a better friend to their plants than they suppose. It would not be at all a sensible or fair thing, if you saw a man stealing, for once, a single turnip out of a field, to say, "Oh, this fellow is a thief—he is always stealing and trespassing—he never does anything else!" The man might be honest, useful and industrious for the rest of his time perhaps—it is not fair to judge of a person's life by one small act. Neither is it reasonable or just, because the little earwig sometimes spoils a flower bud, to say, "This creature is nothing but a mischievous destroyer; it spends its whole time in spoiling things."

Many gardeners no sooner see an insect creeping harmlessly up a stem than they kill it, making sure that it is doing untold mischief and damage there; whereas, if they would but wait a moment and watch, they would often see

that the insect is labouring in their cause and not against them.

The earwig is one insect which is falsely accused. It is far fonder of eating little insects and dead animal matter than it is of devouring vegetable food; and in the hot-house and green-house it is an especially useful servant, helping to clear the vines and other delicate plants from the "cocci" or scale insects which infest them. Some of these are too small even for birds to see, but the earwig finds them out, even when wrapped as they are in a sort of woolly-looking substance which clogs the stems, making them look as if covered with a fine network of cobwebs.

It has been proved that earwigs eat the green-fly, aphis or common blight as well as larger flies. Mrs. Brightwen, who is a very clever as well as close observer, once kept an earwig for a little time that she might find out something of the insect's manner of life; and wishing to know how it fed, she offered it an aphis or green blight, which it ate.

This lady, having read of this affectionate little creature's wonderful habit of sitting upon its eggs to rear them as a bird does, hunted about in her fernery till she came to a small hole, a little place large enough to hold a pea, in which were about twenty-six round white eggs, hard-shelled and shining, each of the size of a small pin's head. An earwig had placed herself over the eggs; and Mrs. Brightwen, delighted to find the insect mother she had been searching for, in the very act of sitting upon her eggs, carefully lifted the nest and mother by means of a trowel, without displacing anything, and put the whole in a saucer under a tumbler where it could be conveniently watched.

At first the earwig carefully examined her new home, touching each morsel of earth and stone with her antennæ,

and having found out exactly what it was like, set to work to make a new nest; toiling very hard till it was finished quite to her mind. She then took up the eggs in her jaws, one by one, and placed them in the new nest, arranging them over and over again until she seemed to think they were settled as well as could be; when she either sat upon them or near them for the rest of the day, quite still and motionless. Every night, and sometimes two or three times in the day, the earwig would make fresh holes in the earth for her eggs; and to prevent the soil from becoming too dry, Mrs. Brightwen used to sprinkle a little water upon it—a drop here and there. If by accident the water fell too near the eggs, the earwig became much excited, hurrying to and fro with her treasures until she had taken them all to a dryer spot. On the other hand, if no water were given and the earth became dry, the earwig chose out the dampest part and seemed to welcome the water drops when renewed: drinking from them, and feeling the moist earth with her antennæ. She remained thus for three weeks, feeding on little pieces of beef or mutton with a fly now and then for a change.

The first time that a dead house-fly was placed near her, she looked at it intently—in a fixed way—for a few minutes, felt it with her antennæ or horns, then suddenly wheeled round and pinched it with her forceps, the curious little pair of curved nippers which earwigs carry at their tails. Then seeming quite satisfied that it could do no harm to her eggs, she began to devour it. After an hour or so, little but the fly's wings remained.

At the end of three weeks all the eggs were hatched, and tiny snow-white earwigs of perfect form, pincers and antennæ all complete, were creeping about and around their

mother. The little ones seemed very pleased with a slice of pear which was given them, swarming upon it, and enjoying the food very much. In a few days they had grown to nearly double their size when first hatched, and they turned a light brown colour. The mother and young were then tenderly put back into their old haunt amid the ferns, where they seemed very glad to find themselves.

From this account it is quite plain that earwigs are clearers up of animal refuse, or scavengers, as well as eaters of blight; therefore they should be welcomed to our gardens, instead of being chased from them. Should they become too numerous, birds will keep them in check; or, if hollow pipes of hemlock, cow-parsley, or elder sticks cut into short lengths be scattered near the places where they live, earwigs will crowd by scores into them for shelter; and these traps may then be carried to a distance and thrown away, into some open field or lane where the little earwigs can do no harm but good only, as God meant them to do in His great garden, the earth.

Very silly tales are told of this harmless little insect; people are so foolish as to fancy that it can creep into their ears and hurt them. The earwig would not like to do that at all! he is far too much afraid of human beings to risk coming near them if he can help it; although if he accidentally fell upon your dress he might perhaps run up your sleeve to hide; but he would not do you the least harm.

The idea must have come from its name, and the name has been changed by some lazy folk who found it too much trouble to say "ear-wing," so they called it "ear-wig" instead. Many words are clipped and cut short in this way, and thus have grown into a wrong meaning too.

The insect was called an "ear-wing" because, although

they are not seen, it has a most beautiful pair of gauzy wings, folded up just like a fan, then doubled across the middle and drawn in beneath the brown scales upon its back. It is thought that one of the many uses to which the earwig puts the tweezers, forceps, or pincers at its tail, is to unfold these wings when it wishes to fly. But the earwig's pincers have unfortunately procured him another bad name, in France. There he is called "*perce-oreille*," or "*ear-piercer*;" because his pair of nippers are exactly like the tool which French jewellers use for piercing the ears of ladies who wish to wear earrings. It seems as if everything were against the poor little earwig; even the things given to it by the Creator, wings and tools to help it, were to be turned by man into an excuse for harming and persecuting the inoffensive mite as it goes about the work given it to do. While busied in carrying on its task, everybody, nearly everybody that is, seems to fancy that it is thinking of nothing but destroying plants, crawling into people's ears, and getting into places where it is not wanted. Yet had this creature not been needed in the world we may be sure that it never would have been placed here; the All-Wise Creator would not have formed this down-trodden insect and given it a place in His plan unless He had seen that it was needed to fill some nook.

I think that those were wise little children of whom I read once, who made friends with an earwig, and used to feed it every day. They called the earwig "Tom," and it used to crawl up the window curtain every day at the same time to fetch its breakfast. These were far more sensible children than the ones who want to tread on and kill every insect they see; or who shriek and make ugly noises and run away if they find one.

If we recollect that God made every living thing for His glory it will make us sure that He made everything for our good too, because He loves us, and made us for His glory also. Even the things that we do not like, or fancy at first that we dislike, it is better to learn patience and love for, because our Heavenly Father made them. We shall be pleasing Him far better by this gentleness towards His handiwork than by destroying what He made in silly fright or evil humour.

Would you be pleased with anyone who was fond of breaking, trampling on, or spoiling what you had made and taken pleasure in? The Bible says that God created "all things" *for His pleasure.*

There is a lesson to be learnt from this humble mother insect too; from her marvellous patience, and from the courage with which she will defend her young—fighting for them if need be; forgetful of herself, her own comfort—her own life. Think of it! A tiny creature with a nest no bigger than would hold a pea, has the brave spirit of a martyr in her wee heart! Surely no one would rashly annoy or trouble her—or crush her carefully guarded eggs—or in any way despise and carelessly ill-use such a being.

Although her home is so small—hidden beneath a pebble or in the crack of a wall—it is the whole world to that little mother; she is a pattern of patient devotion to it, and of courageous unselfishness. The earwig may indeed teach us that every work of God is "fearfully and wonderfully made"—and that the meanest-looking messengers may be engaged upon His errands to us, even though we in our foolishness give them evil and false nicknames, and heap persecution and sorrow upon them undeserved.

Did you think that our God put mother-love
In none but the human breast ;
Or to grander creatures gave the gift
While He shut out all the rest ?

Then list to my tale. In a lowly spot
A mother sits all alone ;
An insect mother whom nobody loves,
On her nest beneath a stone.

For three long weeks of weary days
She has tended her tiny eggs ;
Scarce moving the while for food or drink
Or to stretch her tired legs.

Oh happy day when her young are hatched !
She broods over the little things ;
She cares for each one, she gathers them close
As a hen beneath her wings.

Folk give this mother an ugly name
And scorn her more or less ;
But do not you join the cruel crowd
That cause her to feel distress.

From her ear-shaped wings she once was named,
Not from any harmful tricks ;
*Earwig* and not *Earwing* she now is called,
Unjustly the little sticks.

If she nibbles the flowers she eats the blight,
A far more dangerous pest ;
Speak up for her then when you hear her blamed,
Don't chime in with all the rest !

The creature will not have been made in vain
Which teaches how tender love
Doth dwell down below in the dust of earth
As in the blue sky above.

## QUESTIONS.

Q. 1. What was the earwig once called ?

A. *Earwing*, from the shape of its wings.

Q. 2. What does the French name for earwig mean?

A. Ear-piercer.

Q. 3. Why do the French call the earwig an ear-piercer?

A. Because the little nippers on its tail are of the same shape as those used for piercing ears for rings.

Q. 4. On what do earwigs feed?

A. It has been proved that they eat blights, scale insects, flies and refuse animal matter.

Q. 5. Do insects care for their young?

A. Yes; but they generally die before their young are hatched.

Q. 6. How are the young of earwigs reared?

A. The mother earwig lays eggs, hatches them herself by sitting on them, and takes care of her little ones as a hen does of her brood.

Q. 7. How long does the earwig sit on her eggs?

A. For about three weeks.

Q. 8. What do the little earwigs do when they leave the egg?

A. They creep beneath their mother for shelter.

Q. 9. Of what use are the earwig's pincers?

A. It is thought that they help to unfold the wings carefully wrapped up on the back. The mother earwig uses them to fight bravely for her young, as well as for protecting herself, and for killing her prey.

Q. 10. How may earwigs be got rid of when too plentiful?

A. By placing hollow pipes and stems into which they are fond of creeping; they may then be taken to a place where they can do no harm.

Q. 11. Has the earwig many enemies?

A. Yes; birds, the hedgehog, the frog, and toad.

Q. 12. Has the earwig useful work to do?

A. Yes, much, in destroying blights, scale insects, and others, besides acting as a scavenger. It also teaches us a lesson of patient, lowly goodness.

# Ants.

"The ants themselves
That build a wall of seeds and settled stalks
About their hole—He made all these and more."

—*R. Browning.*

ANTS are described in Holy Scripture as being "a little people," but "exceeding wise." Solomon, who thus spoke of them, was the wisest of all men, and showed his wisdom by studying the works of the Creator. He not only learnt all about plants, from the huge cedar of Lebanon to the tiny hyssop which springs out of the wall, but he also understood the nature and habits of beasts, from the great elephant to the little creeping insect; and after all these studies he found out that God was as wonderful in His small works as in His great ones.

In Palestine, where this mighty king lived of old, there are still to be found ants which store up grain in summer-time when it is most plentiful, although none of our English ants do so, because they sleep all the winter through and do not need provisions. Some persons who only knew the habits of British ants were much puzzled at what the Bible says when it tells that idle people should take pattern by the ant, which lays up food for use during the months when none is to be found in the fields; but travellers found, near Jerusalem, a kind of ant which buries grain in great quantities, and also prevents it from sprout-

ing by nibbling off the shoots as soon as they appear. These insects may have been descended from the very same which Solomon watched and of which he wrote.

In a curious old Jewish book called the "Mishna," there are laws laid down as to how the poor are to glean in cornfields, and it speaks of the stores of grain laid up by ants in the fields, settling to whom the granaries of these little careful creatures are to belong. The passage runs thus: "The little caves of ants when in the midst of a standing crop are adjudged to the owner of the field; of those behind the reapers the upper part is the property of the poor, the lower of the proprietor. Rabbi Meir decides that all belong to the poor, since whatever is in doubt, in gleaning goes to the gleaner."

In America, long since Solomon's time, a kind of ant has been found which makes little farms for itself, cutting away all weeds around its nest except one kind of grass called *ant rice*, which it allows to grow in neat plantations. It plucks the seed of this, stores them up, dries them in the sun when they become too moist, and prevents them from spoiling as cleverly as any human harvester could do. Thus, besides the example of industry they set us, these little insects help to prove the truth of God's Holy Book.

Wise indeed they are! The more we learn of them the more we must wonder at their extraordinary cleverness; but beyond all, we must admire their friendly, loving mode of life, which is quite different in kind from that of almost every other creature. The elephant, the lion, the sheep and cow, the dog, the little bird on her nest;—all these show great tenderness for their young it is true—the parents will die for their offspring, the mates for one another; and

sometimes colonies of animals will make friends and live together as rabbits do; but in the kingdom of ants there is a species of affection and faithfulness shown which is quite different from theirs. Thousands, millions perhaps, of these tiny beings live together in perfect peace, all working for one another—caring, each one not for his own wants in particular, but for the wants of the whole nation; feeding and caring for the young as if they were the property of all alike, to be loved and taught kindly by any grown-up member of the family, as if it were his own business to bring up the children without thinking who the parents are.

The bird when she hovers over her nestlings sets an example of motherly love; but she cares nothing for the broods of others. The sheep loves her lamb, but will push away that of another from her side. Not so the little ants. Their life in the small, round world of an ant-hill is a pattern of what ours ought to be in our great ball of a globe; living on it as we do, human brothers and sisters, the members of one vast family. The ant-hill is less a model of home-life than of that in a huge town, where people should all be neighbourly and live together without selfishness; each earnest to provide for the needs of others as well as for his own; wishful to prosper the *commonwealth* or *good of all.*

There are, in every ant's nest, three sorts of ants—the males, the females, and the workers. Of these each has its own especial task to perform. The males and females are parents of the young, and they consider that this is all the work to be expected from them—an important one it certainly is to provide children for the ant town. The workers do everything else. They are the masons and builders of

the nest, the food providers, the nurses of the young as well as their schoolmasters; in short, they are anything and everything but parents. For their labours they are fitted out in the most exquisite way.

There are many kinds of ants in England; some which are not natives, but which have been brought over in ships or in soldiers' baggage, and have afterwards settled and multiplied here: but the commonest ants which really belong to the country are the little brown garden ant (*formica fusca*), the yellow ant (*formica flava*), and the larger red ant (*myrmica scabrinodis*).

The hills of the yellow ant are to be found on almost every hedge-bank, and in any sunny meadow; those of the red ant being often close by.

If we look at the body of the red ant, which is the largest and therefore most easily observed, we shall find it to be divided into three parts, fastened together by very thin and slim joints, which make the ant's figure light and easy to move. All ants are formed in much the same way, so that a description of this one will, roughly speaking, do for all.

Of these three divisions of the body the first is the head, the middle is called the thorax, and the third the abdomen.

The head has two large eyes, one on each side of it, very wide apart, placed where our ears are, so to speak. These eyes are like those of a butterfly, made of a great many small eyes fitted together in honey-comb fashion so that the ant need not turn them in his head but can see a hundred ways all at once. Besides these two masses of eyes, the male and female ants have three single ones on the top of the head, because they would not, when flying, be able to see clearly enough what is *above* them with only the side-eyes as guides.

Worker ants, which never fly, are without these eyes at the back of the head, sometimes workers are without any eyes at all.

In front of the two large masses of eyes, and in the spot where our eyes would be supposing that we changed places with the ant, two exquisitely made horns or antennæ branch out from the creature's head. These horns are to help the ant in feeling his way, as a blind man uses a stick; for the large lumps of eyes on each side can only see things at a distance. You must remember that an ant spends much of his time in the dark, where eyes of the common sort would be of little use to him. These useful antennæ are made in two pieces, one which comes out straight from the head as a cow's horn does, and another which grows from the first, and is about twice as long. This second part of the ant's feeler is made of a quantity of little pieces or joints fitted into one another, like little cups placed one inside that below it; the last three being joined together into a club form. This makes the tiny horn beautifully flexible, so that the ant can wave it to and fro as an elephant does his trunk. The shape of the antennæ varies, in ants, as well as the form of the head and body, but the general pattern remains.

The mouth of the ant has a small fleshy tongue, and an under lip upon which are two smaller antennæ or feelers; these help him to taste his food and enjoy the flavour before he swallows it. But the strangest thing with regard to his mouth is this—he carries his jaws outside! In front of the lip are a pair of strong jagged pincers with which the ant is able to catch hold of its food and cut it up. These jaws or pincers are not very unlike the tweezers which an earwig bears on its tail and which it can use for the same purpose;

only the ant's jaws have a toothed edge—like that of a saw—on the inner side. These wonderful jaws or mandibles can be used by the ant instead of arms, for carrying food to the nest, or helping a lame friend home, or bearing a dead comrade to be buried, or taking a baby ant to the nursery. They also take the place of a saw, a pair of scissors, a chisel, a spade, a whole box of tools in one, when the ant is building his house or digging out his tunnels and trenches.

The middle part of the body, called the thorax, is made in three parts, and each part has a pair of legs coming from it, one on each side. Such tiny legs!—would you believe that each of the six legs of an ant has a haunch, thigh, shank, and a little five-jointed foot? So small, yet so perfect is the workmanship of this marvel! the whole living creature measures far less than a quarter of an inch, yet each of its six legs is formed of eight complete and separate parts.

The abdomen, or third division of the red ant, is armed with a sting not unlike that of a bee, only of course very small. This kind of ant roams far from its abode, and needs this protection; the yellow ant and the brown ant, which live nearer home, have no stings, but if in very great danger will bite or pinch their enemy with their jaws, and then squirt with the tail some acid juice into the wound. This acid liquid has a rather pleasant, refreshing smell, not unlike that of fragrant vinegar; as you will find if you sniff close to the nest of the red ant. It is called "formic acid," and in medicine has been used in making that merciful drug called "chloroform" which deadens pain. The last syllable of the word, "*form*," still shows that formic acid helped to prepare the soothing mixture.

A missionary, who was very ill from a terrible sickness which caused his whole body to be covered with a sort of

painful boil, once lay in great torment thinking himself about to die, alone, and in misery in a far-off land. All at once, as he was praying to God for comfort, he noticed a great company of ants coming towards him in a manner which they have of marching in that country from place to place. He felt very much horrified, for he was quite unable to move from weakness, and had no power to drive away the swarm. He thought they were coming to eat him up alive. The little creatures crowded up by thousands, and trooped all over him until he was quite covered, and he could feel the sharp pricking of the acid, which oozed from their small bodies, and made his diseased skin smart as if a million tiny darts were piercing it everywhere. The whole army passed over him, and went on its way; but lo! when they were all gone, to his great surprise, the traveller found himself greatly revived; his wounds and sores were eased, instead of being made worse, by the friendly ants; he was able to sit up, and in a few hours, after thanking God for the small helpers sent by Him, he was able to set out once more on his journey.

At a certain time of the year, generally in August, multitudes of winged ants may be seen, sometimes quite thickening the air; indeed they would in some parts render it quite unfit to be breathed, were it not for the help of the kindly swallow, and others of the bird tribes in clearing them away.

The greater part, nearly all, in fact, of these vast clouds of flying ants, are eaten by birds, fall into the water to become the prey of fish, or are otherwise destroyed; but some few here and there reach land again safe and sound, and it is in this way that an ant's colony is begun.

All the males die after this flight or swarming in the air, but the females which alight, set, each quite alone, to work

at forming an ant's nest of her own. The first thing she does is to break off her beautiful wings, for her day of sport and pleasure is over; she is content now to think only of work, and duty, so she twists and turns her gay wings backwards and forwards till they snap off, short, sometimes nipping them away with her jaws if she cannot otherwise get rid of the fine dress now useless to her.

Next, she finds a spot where the earth is loose and dry on some sunny slope, and digs out a little hole; makes a cell or two, and lays her eggs. At first the mother-ant, or ant-queen, for she is head of her ant-town for some time, is obliged to do everything herself for the royal babes. But at length her young turn to ants; some to males, some to females, some to workers; and before long she is surrounded by quite a large company, including many of her own sex. Her worker-children begin as soon as they are able to enlarge the nest or ant-hill, by digging new cells, passages, and chambers; and they take upon themselves the care of their little brothers and sisters which are born from other hatches of eggs which the old queen still continues to lay, and which in time some of her queen-children also begin to drop. Although the females or queens are treated with the greatest honour, respect, and affection, the little workers seem to know that the ant-town could not go on without the eggs they lay, as the old ones would die, and there would be no young to take their place; therefore they do not allow their queens to go away from them; if they leave the nest, they are surrounded by a body-guard to prevent them from wandering too far. From the time that the ant-hill is peopled with workers, the females or queen-ants take no further notice of their eggs, merely letting them fall in various parts of the nest to be collected

by these industrious servants, who seem to think that the queens have then done all that can be expected from them; and follow their sovereigns, feed them, caress them, and wait on them with perfect content, seeming always glad in their presence.

The workers pick up the stray eggs, which, as they would be difficult to carry one by one, are usually found sticking together in bunches. These clusters of eggs the workers carry into cells which they have scooped out on purpose for them, and then their nursing cares begin.

Underneath the ant-hill of either the common red, yellow, or brown ant, many chambers will be found, connected by passages and corridors. The ants, especially the yellow ones, are most particular to carry their eggs up from the lower to the higher nurseries, or down again, according to the weather. They let the eggs have some sunshine on a cool day, but if it is too hot, they carry them downstairs again. If it is cold or damp below, they change once more to higher rooms.

After a while the eggs are hatched, and the ant-grubs or larvæ come out. Those of the yellow ant are short, whitish grubs, without legs or limbs of any kind but a few stiff hairs. They cannot feed themselves, but when hungry stretch out their heads with open mouths to the workers, who give them, from their own crops, food, half-digested, in the same way as doves and pigeons feed their young; or else they feed their charges with something sweet scraped together with their jaws, if it be fit for them. What an amount of running to and fro—what ceaseless thought, care, and toil all this must bring upon the little faithful foster-mothers! The babies are not their own—all the coddling and fussing, all the hurry and bustle which you may see one

of these fond specks of things so busy and happy in carrying on, as it wanders up and down the blades of grass, which for it are as a thick forest, or runs round some tiny puddle which seems like an ocean, or climbs some small pebble which is a mountain in its sight—all this labour of love is neither for itself nor for its own young, but for the good of the little ones who belong to no one in particular. What a lesson for those who have no home-cares of their own, and yet who cannot find anything to do for other people!—for the children of some overworked neighbour for instance. For if among ourselves the young are not common property, they ought at least to belong to everybody alike in one way—that of being beloved by all, never harmed by wrong example, always helped and trained by their elders when a chance to do them good comes.

The ant-babies must be washed as well as sun-warmed by being carried upstairs, for ants are very clean creatures. They lick the eggs and larvæ, and attend to their own toilets as well; each ant has a sort of comb growing on its front legs with which it is careful to scrape itself all over.

After a while these small helpless grubs make shift to do something for themselves; they spin little silken cocoons, as a silkworm does, but of white silk, inside which they go to sleep. It is these little pupæ, chrysalids, or cocoons of the ants which look so much like tiny grains of rice, and which ignorant people often mistake for eggs: but the *eggs* of the ant are about one-third of the size of the pupæ.

Towards these tiny chrysalids the little yellow ants may be seen, on any summer day, showing the greatest care and attention. Should their ant-hill be accidentally disturbed by the foot of some passing animal (it would be a pity indeed to wreck it on purpose), the first thing that they

think of is to snatch up these precious burdens in their jaws and hurry off with them to some place of safety.

Men who supply the cruel bird-catchers and traders with the so-called "ants' eggs," which is a favourite food of so many of the poor little prisoners, in reality procure these pupæ; and they take advantage of the strong love of the ants for their helpless young in the following way.

An ant-hill is laid low by their spade, the earth being scattered abroad; a trench of water being first made round the spot. Then a branch of fir, or some other shelter, is placed within the small ditch, which the ants cannot pass, for they are not able to swim. The ants will collect every one of the little white pupæ and place them all under the refuges, where they think that their treasures will be safe; when the men come, and finding them collected together, take them all away. See how one hard-hearted deed leads on to another! first the poor little birds must be cruelly snared, and then other tiny things tormented and worried in order to obtain food for them. If the people who do such things begin with one unmerciful act, they are likely to go on and on till they become quite brutal at last.

After a short time spent in keeping these cocoons clean, carrying the pupæ up or down to suitable spots according to the weather, and otherwise taking care of them, the untiring little guardians seem to know that the hour has come for the living creature inside the white wrapper to awake from its slumber, and to come forth.

With the greatest gentleness, three or four worker-ants tear apart the silken covering of their nurslings one by one, always beginning at the right end—where the head is. The young ant is tenderly drawn from within, but it is still clothed in an inner covering, or little shirt, which the kind

nurses softly strip off. Their charges, set free from the swaddling clothes, are now perfect ants; those which are workers having no wings, while the males and females have gauzy crumpled bits of gauze joined to their backs, which are carefully smoothed out for them, and by means of which they are soon to fly from their loving nurses. The winged ants now crowd eagerly to the doors of the ant-hill, that they may try a flight with these new-found limbs: the fond workers who have reared and sent them forth into the world following behind with anxious, hurried tread, as if they feared the parting and dreaded to say good-bye to those whom they had so earnestly tended from their cradle.

As those ants which are about to fly part from their old friends, the wingless workers climb up the grass stems after them, and sometimes succeed in holding them back. It is then that they, by force, detain many future queens, even breaking off their wings, it is said, and also driving back some of the young princes or males, whom they force to remain in the ant-town as mates for the princesses, lest none but workers should remain in the nest.

The greater quantity, however, are allowed to go. By sunset the entire crowd of flyers has disappeared, either by falling victims to the weather, to birds, to spiders, or to fishes; those which are left alive become, as we have seen, the founders of new colonies, at least, so it is thought.

A lifetime would scarcely be long enough to spend in telling of all the wonders of the ant-world; especially in foreign lands, where many larger kinds are found with habits still more strange than those in our own country. Some of these actually make slaves, stealing the pupæ of a smaller kind of ant and rearing them, but very kindly, to be the

servants in their conqueror's nests. There is an ant slave-making species to be found in England, but it is doubtful whether this is really native.

The little yellow ant, our commonest kind, makes no slaves, but it keeps a sort of very small blight or aphis, just as we keep cows, for the sake of sucking from it the sweet juice which the little creature sends out, and which is as pure as honey. The ants know how to coax their little cows to give this juice by stroking them gently with their antennæ; the tiny ant-cows seem to enjoy this petting or milking. If you watch a currant bush, or any other plant which is blighted, you may see an ant milking its little cow; and afterwards perhaps it will very gently take up the small Alderney and bear it along, carefully carrying it away to the ant-town; not to be harshly treated, starved or overdriven, but to be cared for most affectionately; pastured perhaps on some daisy-root or dock-leaf close by, and looked on as the special property of the ant. The yellow ant not only does this but it collects the eggs of the aphis, keeps them in its nest, so as to rear its own cows!

This is what the ants are doing, most likely, when you see them so actively running up and down the stems of plants or trees; one stream passing down, and another procession filing up. Probably they are fetching aphis eggs, and attending to the herds of ant-cows, milking them or driving them home. They make haste on their errands that they may run quickly back to carry some of the sweet stuff to the little ones at home; the ants prefer the juice of their favourite blights to any other sort of food, and in clearing the stems and leaves of plants from this sticky covering they do much good.

In America, Germany and Italy, fruit-growers welcome

the ants; for they say that no trees are so free from blight as those which have large ants' nests at their foot.

The little brown ant, like all other ants, is a most useful scavenger. If a dead bird, beetle or caterpillar, if any scrap of refuse be found by an ant, as soon as he finds anything which needs clearing away, he first tries whether he can carry it home alone to the nest where it will do for food and where others can share it with him. If he cannot move it, he will go away to the ant-hill and fetch some friends, telling them the news by means of his wonderful antennæ, which are to him a voice, eyes, ears and a nose all in one. After a little conversation by means of the antennæ these ants will set out with him, return to the prize, and see if they can manage to carry it among them. If too large, they will bite it into pieces and carry it bit by bit; but if they cannot do this, they will send messengers to the nest, and the whole ant-town will turn out together to feast upon the dainty where it lies, till not a morsel of it is left. Sometimes naturalists who wish the skeleton of a small animal or bird to be carefully cleaned, set it down near an ant's nest; when the ants will do the business for them.

When an ant is sick the others do all that they can to help it; once an ant was seen to go up to a poor friend, whose horns had been cut off, and anoint the places with a drop of liquid from its mouth. They will carry home a wounded comrade in their jaws most tenderly, if he belongs to their own nest; but a stranger they will leave alone. All the ants belonging to the same ant-town know one another in some strange, mysterious way, and never make mistakes between friends and outsiders.

Ants sometimes bury the dead bodies of their friends, but they think it more important to care for the young than to

waste time upon those whom they can no longer help: an ant, carrying away a dead body, was once seen to lay it down half-way on its journey to the burying ground because it found an ant-baby lying in the path. This it took up, turned back, and carried to the nursery instead. Was not that very wise and thoughtful? Some ants merely throw their dead outside the nest, but others have been seen to dig regular graves and bury them in a spot which seemed to be set apart as a cemetery.

It is thought that English ants sleep through the winter. They may be seen to rest when tired; lying down as if to take a nap. They work by night sometimes as well as by day, if there should be much to do.

When the sun is shining they may often be watched at play, dancing about and romping as if they enjoyed the warmth;—much as a set of school-children do on a holiday.

The more we learn of ants the more we shall feel how wise it was of Solomon to point them out as models of how a great family should live and behave towards each other. The ways of ants ought to make us feel ashamed of our narrow, selfish modes of behaving, and of our cold indifference to the needs of that vast human household in which we are all brothers and sisters. Truly the ants, though a little people, show their exceeding wisdom!—they are wise in their way of working, but wiser far in their wondrous self-sacrificing love.

Little people in your school
May I read the golden rule,
Learn to treat my human brothers
As I would be used by others.

Should I find them in distress
May I use all tenderness,
Plan for all the brotherhood,
Choosing not my selfish good.

Cheerful set about my work,
Never honest labour shirk;
So, with peaceful, quiet breast,
Calmly lay me down to rest.

## QUESTIONS.

Q. 1. How many kinds of ants are to be found in every ant-hill?

A. Three—males, females, and workers.

Q. 2. Which sort does the most work?

A. The workers do everything but laying eggs.

Q. 3. Can ants fly?

A. Yes; the males and females, not the workers.

Q. 4. Into how many parts is the body of an ant divided?

A. Into three parts—the head, the thorax, and the abdomen.

Q. 5. How many legs have ants?

A. Six legs—each having a thigh, haunch, shank, and five-jointed foot.

Q. 6. Why did Solomon think ants so wise?

A. Because, instead of wasting food when it was plentiful, they stored it up.

Q. 7. Do English ants lay up stores of food?

A. No; because they sleep through the winter; but near Jerusalem a kind of ant is found which stores up grain.

Q. 8. What does the ant give as a medicine?

A. Formic acid, which was once used, and still might be, in preparing chloroform.

Q. 9. Of what use are ants to fruit growers and gardeners?

A. They help the trees, shrubs, and plants by clearing away blights, as well as their sticky juice, which chokes the leaves.

Q. 10. What does the yellow ant do with blights?

A. It keeps them as we do cows, for the sake of the sweet juice which they give.

Q. 11. Of what other use are ants?

A. They are very useful in clearing away refuse, which would be unwholesome if left lying about.

Q. 12. In what way does the Bible praise ants?

A. By holding them up as an example to idle people: "Go to the ant, thou sluggard; consider her ways and be wise." (Prov. vi. 6.)

# Flies.

"God wills you never pace your garden path
One appetising hour ere dinner time;
But your intrusion treads out of life
A universe of happy, innocent things!
Feel you remorse about that damsel fly
Which buzzed so near your mouth and flapped your face?
You blotted it from being, at a blow.
It was a fly, you were a man and more,
Lord of created things, so took your course."

—*R. Browning.*

If in describing the work of flies in this world of ours we were to say that it was like that of birds,—the same work indeed, only carried out by a more minute set of labourers in a more wide-spread way,—this account would not be far wrong.

These smaller winged creatures seem to begin where the larger ones leave off, and to carry on their task in places where birds are not found; doing that which is too small or too near the abodes of men for birds to undertake.

Just as the swallow, fly-catcher, wren, sparrow, and many others are always busied in clearing the air of small flies, as well as the earth, trees, and plants of their young in the form of grubs, so whole armies, vast legions, of flies are always hard at work keeping in check a smaller set of insects than themselves—feeding in many cases exactly as birds do,

either on the very same kinds of food which are chosen by their larger winged brethren or on smaller sorts, which would be unnoticed by them.

In the kingdom of flies as well as in that of birds we shall find a tribe which hunts and kills, preying on the bodies of its victims; also we shall find a troop of scavengers. But besides these there are many species which, like the gad-fly, live by sucking the blood of large animals. Birds are exactly and wonderfully fitted for the life they lead, but flies are not less so. Each kind has a body, limbs, wings, and tools, all quite as well suited to their work as are the beak, feathers, and claws of birds.

The lovely tribes of butterflies and moths which seem to have been formed for our admiration and delight as well as for the glory of God, need nothing for their food but the sweet juices which they suck from flowers. For this they carry a long tube curled up after the fashion of a watchspring, to dip into the cup of each bloom in turn.

But the dragon-fly, the largest insect of prey to be seen in England, and which hovers and pounces like a hawk upon other flying insects, has a tremendous pair of jaws for this purpose, though it is otherwise quite harmless, and is wrongfully called the "horse-stinger." It possesses neither sting of any kind, nor claws, nor poison at the mouth as the little gnat does; its strong jaws are meant for seizing its prey, nipping off the wings, and cutting it into pieces.

A friend once told me that he had seen a dragon-fly catch a blue-bottle and settle with its prize on a leaf. He drew softly near to watch it feed, and found that the creature was so intent upon its meal as to allow itself to be touched, taken into the hand, and its wings gently stroked, while it swallowed the dainty morsel in large gulps. But

when all was finished, the dragon-fly seemed to awake to its danger, and darted off like a flash of light.

These gloriously bright creatures, clad in their plates of glittering green, blue, or golden-red armour, are generally to be found flitting upon their rainbow-coloured wings across ponds or still water, in which they lay their eggs. The egg is hatched, and the grub toils in the mud beneath for three years at scavenging; walking about and seizing every moving thing it can see with a long pair of pincers, which it is able to unfold all of a sudden, shoot forward in front of it, and then close up again. When ready to change into a new life, having earned pleasure by hard work, the dull, mud-coloured creature rises from the slime and ooze of the pond, creeps up a rush-stem, splits open its skin, and soars away into the sunshine, with a glimmer like that of rubies and diamonds. Here it goes on, being useful in clearing the air world, as it did the water world, of the swarms of living things which would overcrowd it.

The hosts of flies which have this same work to do would be far too many to be counted up. Flies may be seen employed in clearing bushes, trees, corn-fields, garden-plants from blights, by eating the full-grown insects, others by destroying the eggs; but there is a vast tribe of these creatures called "ichneumon flies," who go to work in a different way, attacking the grubs before they enter the winged stage.

Some kinds of ichneumon fly are so small as hardly to be visible without the help of a microscope, others are fairly large, and may be watched at their affairs. Without these helpful beings it is impossible to tell how unfortunate we should be, for the crops would suffer terribly, as well as the fruit trees and garden produce. Our cabbage plants, in

particular, are preserved partly, it is true, by the care of sparrows and other birds which eat the green caterpillars infesting them ; but perhaps even more is done by a certain ichneumon fly called the microgaster. This creature, like all the rest of its kind, lays its eggs in the living bodies of caterpillars.

The female, when she wishes to lay an egg, flies to a cabbage plant, and, running to and fro upon the leaves, searches till she finds a green caterpillar. When she has found one she takes care that no other fly has already laid its eggs there ; if so, she passes on to another, for fear that her own should not find enough to eat when hatched. She makes a prick in the body of the caterpillar with a spear which she carries at her tail on purpose, and drops in an egg. If there is room enough for more to feed when born, she lays more eggs, always regulating the number by the size of the body they are to devour. This is the more wonderful because she herself takes no food but a little honey. Though a different feeder, she knows where it is her duty to place her eggs so that her future young may be properly fed though in a way unlike her own.

When the eggs are hatched inside the caterpillar, the tiny grubs of the ichneumon begin to feed upon its soft flesh, carefully turning aside from those parts which, if destroyed, would cause the caterpillar to die. For a time the cabbage grub seems not to care, and at any rate it appears to suffer no pain, for it goes on eating as if nothing had happened. At length, however, it dwindles down to little but an empty skin, and dies, either before changing into a chrysalis or while in death-like sleep. It has been counted that thirty-nine out of every forty cabbage caterpillars perish in this way.

Those flies which have to pierce the hides of animals are armed for the purpose most completely. The gad-fly, which glues its eggs to the horse, taking care to place them only on such parts as the horse licks, has a whole cluster of knives and lancets for cutting and opening the wound, as well as a tube for sucking. The grubs of this fly go through their early stages inside the horse, being taken in by the creature's tongue and then swallowed. They are dropped upon the ground after mixing with the horse's food, and there change into the perfect gad-fly.

The bot-fly, which attacks cattle, and the breeze fly, which bites sheep, lay their eggs in the skin after piercing it. If allowed to over-increase, these flies become a terrible trouble to domestic animals. The starlings and other birds which feed among the flocks and herds, running in and out between their feet and sometimes settling on their backs, do great and kind service to the poor things by ridding them of these flies; and there could not be better comrades for them in the meadow than the dragon-fly, which will often hank round them and seize the smaller game in the very act of boring into the skin.

The pretty dor-hawk or night-jar has been wrongly called "goat-sucker," from its habit of hovering and skimming round cattle, flitting close to the udders of cows in order to catch the flies which crowd there. People have been so stupid as to think that it sucked their cows! what a pity that they do not use their eyes better.

But we must not make too sure that even these flies which annoy horses, sheep, and cows so much are doing all harm and no good. Wise men who have felt sure that the great Creator made nothing unmercifully, although sinful man has so sadly spoilt His plan, have found out that the

seemingly cruel gad-fly, with others of his family, have a great duty to perform in life.

In some lands where large herds of animals such as reindeer, buffaloes, and other, wild creatures feed, and also in great tracts of country where horses, cattle, and sheep wander in a half-wild state, very little under the control of man, the swarms of flies act like drivers, forcing the flocks and herds from place to place; for instance, from the high to the low lands, or from the hill top to the river side, where they go to take refuge in the water from the attacks of these winged tormentors. Thus their pastures are renewed, the old and trodden ground left to recover itself, and the grass to spring afresh, while new land is grazed upon, and by this is fertilised in its turn.

Besides this, there is no doubt that the bites of flies, in moderation, serve as a sort of life-giving power to animals, which in more rich and cultivated meadows would become sluggish, fat, unwieldy, and in time too lazy to move, and thus suffer injury; man having provided food for them in plenty, so that they have lost their natural, healthy habit of moving about from one spot to another in search of nourishment.

Mr. Galton and other learned writers think this, and say that fleas and other parasites are of great service to over-petted dogs in giving them an irritation of the skin; also (though we need no one to tell us anything so plain and simple), that the most unpleasant kinds of these parasitic insects, which attack the human body, are sent as a warning to man himself. They bring a message to him that he must be up and doing—and exert the powers which have been given to him in order to keep himself and his abode clean.

One of the best horse-doctors has said that the gentle irritation caused to the stomach by the gad-fly grubs does no harm to *a well-fed horse*; but rather good. It is only when driven to madness by the attacks of many of these flies, or when the animal is in a poor and meagre condition, that it is rendered miserable.

The gnat and the tiny midge are both miracles of elegant beauty when seen under the microscope. The gnat has two large balls, each made of many thousands of eyes, joined like a honeycomb; it bears delicate plumelets on its head, which help it to feel, and carries six lancets, with a seventh instrument like a spear, which is hollow, and acts as a trunk as well: either taking up what the gnat wishes to suck in, or letting flow a sharp poison from the mouth into the wound which the lancets have made.

The greater part of the slender-bodied flies can live on flower-juices if they please, and most of them spend the first half of their lives under water as the dragon-fly does. The gnat forms a graceful little boat of her eggs, which floats in the sunshine on the top of a pond till they are hatched, and the little creatures which drop into the water from them spend their time in clearing the water below until they are ready for another change. The young gnat then creeps up to the surface again by some bit of weed or stem; and splits its skin off. Upon this cast-off garment it floats, using it like a little raft, until it is ready to fly. The curious large-headed gnat-larvæ may easily be watched as they jerk themselves along sideways with a single limb which looks like an arm; even water-butts out of doors are often full of them. They are most useful scavengers, and prevent stagnant water from smelling very bad.

But perhaps if we were to ask which was the most useful

of all flies in this country, we should have to name either the blow-fly, the flesh-fly, or the house-fly. It is certain that without either of the three, our world would be a place of terrible punishment, disease, and misery, even if we could live in it at all, instead of being the wholesome, pleasant, cheerful place God meant it to be.

Both out of doors and in our rooms these quick, busy, hard-working insects are always toiling far harder than the servants who sweep the house, clearing away everything which could do us harm, or poison the air. Wherever anything evil or putrid has been left about, thither the flesh-fly will certainly come, without any loss of time, and the blow-fly is very like him in habits as well as in looks. When one learns that the female flesh-fly lays about sixteen thousand eggs at once, which send forth grubs to devour the moment that they are hatched, sometimes in a few hours only after the eggs have been laid, beginning the instant they are born, and never stopping day nor night till they turn into cocoons, and then rapidly into flies; and when you find that these new-born flies begin laying more eggs at the rate of sixteen thousand apiece, you cannot be surprised at the speed with which a very large carcase would disappear if once a solitary female flesh-fly settled on it.

When Linnæus said that three of such flies would eat the carcase of a horse faster than a lion could, he was right—counting, of course, their young. For the lion certainly would not go on eating all day and all night as these industrious little feeders do. While the lion was resting they would get ahead of him. The hotter the weather is, the faster these grubs are born in flesh; and, as if to save time, they do not change their skins as others do, but merely stretch them like bags, till at last they harden into cocoons.

We can never be thankful enough to God for the blow-fly and the flesh-fly. They are among His many helpful messengers to us which we do not recognise as good angels, but which are a blessing to us all the same, whether we are grateful or not.

Those flies which, like the blow-fly, flesh-fly, and house-fly, feed on soft matter, have no cutting, tearing, or stabbing tools. They possess instead a most wonderful, intricate trunk, which is made with so many joints and bands that it can be turned in any direction, used in every way required, and be both strong and light. By this the perfect fly feeds, for it is without jaws, and cannot live on solids—the grubs alone devour these.

The common house-fly lays its eggs wherever dirt and filth are allowed to accumulate; so that when folk talk, as they seem fond of doing, about what a nuisance the flies are, it would be well for them to remember that their own unclean habits help to produce the plague. House-fly grubs feed on refuse, vegetable as well as animal, until they lie by for a while as little chrysalides, and then they come out winged and ready for a different life. They begin to buzz about our rooms, collecting on their legs and wings all sorts of floating specks which otherwise we might breathe into our lungs and find harmful; the very flight of a fly through a close room is wholesome. Besides this they clear from every hole, crack, and corner the tiniest scraps and the dust of food which even in the best kept houses cannot be removed because it is unseen. Look at a house-fly—it is well worth your notice. What an amazing hurry it is in, on a warm day, and what clever tricks of running and climbing it can perform! See how it can trip straight up the glass window-pane, or stand head downwards upon the ceiling.

Its six tiny feet are able to press out a gummy fluid which sticks them on to whatever it walks upon, and gives it a firm hold; and it lifts each foot sideways, so that it may come up easily, just as you find a wet postage stamp will do if you take it by one corner, but not if you take it by the middle.

It has two balls of eyes, each made of more than seven thousand small ones, all looking different ways. It is no wonder that the fly can see what we can not. And as for its trunk, that is a marvel indeed, as anyone must say who has seen it under the microscope. Look how easily the fly can sip a drop of milk with it! the drop grows less and less, you cannot tell how, and the little thing flits away refreshed. A lump of sugar will dwindle too in the same way; how does he manage to suck up that with his tube—as it is solid? His plan is very simple. He first sends down a fluid from his mouth, which melts what he wishes to feed upon, and then sucks it up in liquid form.

Surely no one could wish to harm such a creature, after the hand of God has so wondrously created it. Far better and pleasanter would it be to let the little fly go about its useful happy bit of life-work untouched. It will learn to know you if you try to tame it.

An opera dancer who was very fond of insects once placed a bit of cotton wool on his mantel-shelf with four sleepy flies in it which he had picked up half-dead from cold.

He wished to be kind to them and to see whether he could save their lives through the winter. The flies grew accustomed to their little home very soon as well as to their friend, and used to come out to feed every morning at his breakfast-table, going back afterwards to hide in the snug wool. At last three out of the four died, and only a soli-

tary one used to creep out each day, and sit, as it had been taught to do, upon the thumb nail of the man, where he always put a little morsel of sugar mixed with butter for it. He was in hopes that this single fly would linger on to feel again the spring sunshine and to rejoice in a new life under the warm beams. But alas! one day the poor little fly made a sad mistake; it settled on the hand of a stranger who was taking breakfast with its gentle master. In an instant the visitor clapped his other hand upon the frail little thing, and it rolled over dead and motionless.

How many people are like that guest—how few like the tender-hearted and patient protector of the hapless fly! Which man do you admire most?

A sweet little fly came floating, and, flitting and fluttering down,
Wheeled closer in airy circlets, till it settled at length on my gown.

I was lifting my hand to crush it for daring to make so free,
When a soft, tiny voice came thrilling, and thus did it murmur to me:

"Ah, listen! I thought it would please you to hark to my musical hum;
I trust my frail life to your pleasure, I thought you would like me to come!

"For all the long day I've been busy at work, but my toil's almost done;
Let me rest, safe, unharmed on your finger,—I die ere the set of the sun!

"Though so small and so tiny my labour, I did it with all my might;
To make the world sweeter and cleaner; I know I have done what was right."

"Rest and welcome," I said, "little stranger, ruby eyes, wings with pearl scattered o'er,
Be certain that *I* will not harm you—your death shall not lie at my door!

"For I see that your life is a pattern—your wee bit of work, little fly!
To make the earth purer and better—to go and do likewise I'll try."

## QUESTIONS.

Q. 1. What is the work of flies?

A. They act as scavengers.

Q. 2. How are they kept in check?

A. By birds, fishes, and insects of prey.

Q. 3. What is the largest English insect of prey?

A. The dragon-fly.

Q. 4. Can dragon-flies sting or bite?

A. No; they have no stings, and only bite their prey.

Q. 5. Is there any use in the gad-fly and his like?

A. Yes; they have a use in making wild cattle move from spot to spot, and in preventing the flocks and herds from growing too indolent.

Q. 6. What is the use of fleas and other parasites?

A. They bring a warning to man that he must keep himself and his dwelling clean.

Q. 7. What would you name as the three more useful flies?

A. The blow-fly, the flesh-fly, and the house-fly.

Q. 8. How is the blow-fly useful and the house-fly?

A. By devouring putrid flesh.

Q. 9. How many eggs does the female flesh-fly lay at once?

A. About sixteen thousand, which begin to produce grubs very soon.

Q. 10. What use is the house-fly?

A. It clears our houses of refuse too small to be swept away.

Q. 11. Where do house-flies lay their eggs?

A. In sinks and places where dirt is allowed to collect.

Q. 12. Then what must people do who wish to have few flies?

A. Keep their places clean, then the flies will not be wanted, and will not be born.

# The Mole.

"As a mole grubbing underground,
When it comes to the light
It grubs its way back again,
Feeling no bias of fur
To hamper it in its stir,
Scant of pleasure and pain,
Sinking itself out of sight
Without sound."

—*Christina Rosetti.*

As the bird is formed for a life in the air, and the fish for swimming in the waters, so is there a beast made on purpose for delving in the ground; its home away from the light; fitted for inhabiting the soil, yet just as happy as any other creature, because planned for that and for no other life. This animal which dwells beneath our feet is the mole.

Its shape is the first thing to be noticed, if we wish to make sure that it was thought of by God, and suited by the Divine mind to fill the place where it is found. Its body is not unlike a long, slender fir-cone in form, ending in a pointed tip, exactly the sort of tool which a clever workman would choose if he intended to bore through the earth. This cone-shaped body, ending in a sharp snout, is armed at the extreme point of the nose with a strong bit of hard gristle, making it easy and not painful for the mole to force his way into the ground.

He is helped, too, by his feet, which seem to join the body almost without legs—long limbs would only be in his way.

The mole, then, has paws, and they are extremely remarkable in form and make. The front feet, paddles, or *hands* of the mole (for they are more like hands than anything else) have the soles or *palms* turned outwards, not inwards like our own; they are very broad, and are armed with strong nails. He begins making a hole when he wishes to go underground by pushing his snout into the earth, moving it from side to side, and at the same time making a jerking movement of the broad paddles or hands, not unlike that of a man when swimming, which tosses away the earth. It is almost marvellous, the speed with which a mole will thus disappear under the surface; he seems almost to sink beneath it, going through the soil as easily as a cheese-scoop passes into cheese.

His eyes are so very tiny that a horse hair could hardly be passed through the opening in the skin which they make; it is difficult to find them, because, for the sake of protection, they are quite buried in the fur; yet the mole is able by means of them to see quite as much as he needs. Of what use would large eyes be to him where he lives?

One day when walking along a country road I picked up a pretty mole, quite dead. It had been driven over, for the mark of a cart-wheel was across its velvet fur; and it had only just been killed; the body was quite warm. As its backbone was snapped in two it must have died in an instant. I turned over the poor little body to look at the tiny hands, and to try whether I could find its eyes; but I could not for a long time. Whichever way I stroked the lovely silvery coat of the mole, either towards the head, towards the tail, or across the body, it lay equally smooth. It had not mattered to him when he was alive whether it was "rubbed

the wrong way" or not. I could not help wondering as I passed my hand to and fro over the mole's jacket how it was that a creature which spent its time in passing through the earth could keep itself so daintily clean; the coat, paws, and nose were without speck or spot. The mole had a short tail —doubtless a longer one would have been much in his way, and his hind feet were smaller than the front ones—they were stretched out as if he had been running very fast. Unlucky little fellow! I suppose he had been crossing the road on his travels from one field to another, and, being overtaken by some swift gig or market cart, had not been able to get out of its way.

After admiring him very much, I laid the dead mole beneath the hedge and covered him with a handful of dead leaves and moss; and I daresay that before long the sexton beetles came and gave him a grander funeral.

Across the fields tracks may often be seen which the mole has made in his passage underneath; he works his way along nose foremost, the paddles or hands thrusting the earth behind. Every now and then, when the mole's tunnel is too much choked up by the loose earth which hinders him, he jerks it upwards, out of his way, by a mighty heave of his muscular back. It is thrown up right through the grass or corn which is growing on the surface of the ground above him.

Farmers do not like the sight of these mole-casts or mole-hills; so they employ men to catch the moles, or else set traps for the creatures. They also fancy that the moles do mischief by eating roots,—this is a great mistake.

The mole does enormous good to the land in two ways. First, his tunnels serve as drains, carrying away moisture from the roots of crops, as well as letting in air, which is of service

to them, especially to corn. Secondly, they eat quantities of cockchafer grubs, wireworms, and other insects which, in great numbers, are most destructive, besides preventing the earthworms from becoming too numerous.

Earthworms are wonderful fertilizers of the soil, but if they were left alone to multiply without check they would do more harm than good.

Moles never touch vegetable food of any kind; they live entirely by hunting, and have even been seen to spring at and capture small birds. If so, it is likely that they devour mice also. Could the farmer be persuaded to spend one half of the money, time, and trouble which he lays out in persecuting the mole in just sending out a couple of lads with spades to scatter the loose earth abroad which these creatures throw up, he would be doing better for his fields and for his pocket. The hills, if left alone, spoil the ground for mowing; but if levelled before the grass grows over them, the fine earth would be excellent manure for the field, the mole-casts would not check the scythe, and the farmer would keep the underground labourer, who toils unseen for his profit.

The mole is not *always* making mole-hills; it is only now and then that he comes near enough to the surface to push his castings through, and but at a certain time of the year.

He does not dig a mere burrow and live at the end of it; his dwelling is among the most wonderful and elaborate structures which any animal is known to contrive for itself. He has an underground castle, or palace, with galleries, passages, and a "keep" or inner stronghold in the centre of all. This house the mole begins by making a large mound in a safe place, usually hidden under long grass, brambles, or herbage. In the middle of the hill (working

from below) he digs out a round chamber, approached from beneath by a long tunnel. But this passage and simple room at the end of it are not enough to satisfy the mole; he next digs out three openings or short passages upward from the *ceiling* of his chamber. The three passages lead into a gallery which he scoops out in a circle, and which runs around the top of the central chamber, outside it. But this gallery is not all. From it the mole makes on every side more short passages, leading downwards into another circle or second gallery, going still around the middle chamber at a little distance outside the floor of it. From this lower gallery lead tunnels which stretch away on all sides into the ground, after the manner of a spider's web. The whole maze of winding passages, tunnels, rooms, and galleries the mole makes always after the same perfect fixed pattern, partly as a safeguard against foes, such as the weasel, or those of his own kind, who might attempt to attack him in his own quarters; when pursued, he would be able to retreat, and, by running into his castle-keep, be able to shake off his enemy entirely, or at least have the chance of turning so as to face him, which there would not be room to do in one of the narrow tunnels. The chance of turning away in one of half-a-dozen directions would also be before him when he reached the central room. But the mole's keep is useful not only as a refuge from underground dangers, but also in cases of alarm from above —dogs or men. When frightened from overhead, the mole can tell which way is best for him to take for escape by retreating to the keep and listening; for he has ears, although they are carefully tucked away in his fur. While taking a turn round his fortress he finds out in which direction the danger threatens most, and chooses the tunnel

which leads the opposite way, just as a spider would run away by that thread which would take him straight from you if you touched his web. Also, it may be that the mole's cunningly-planned den acts as a ventilator, and prevents his habitation from becoming quite airless.

When the mole has a family, he makes a nest out of dry grass, leaves, or hay, always placing it at a spot where two passages meet, so that his wife and little ones may have a double chance of escape should any danger approach them.

The passages which branch out from the mole's keep lead to his hunting-grounds; he is not always digging new ones, and does not spend his whole time in wandering about underground, as some people seem to think, or strolling here and there in an aimless way. He stays at home, as a rule, within his own grounds, seldom going beyond the beaten tracks, which soon become quite polished and hard inside from the constant rubbing of the mole's fur as he passes along them. This makes the passages firm, so that they do not fall in, and no amount of rain seems to damage them.

Along his tunnels the mole can dart so swiftly as to keep pace with a horse trotting at full speed above; and far from being a dull or sluggish animal, he is full of life and spirit. This he shows by fighting very fiercely sometimes when he meets another mole trespassing on his premises.

He is not fond of damp, boggy places, because he cannot there construct his dwelling; perhaps this is the reason that no moles are to be found in Ireland. But he is a thirsty creature, and in order to supply himself with water he is clever enough to sink wells at the end of some of his tunnels.

If you should ever chance to meet one of these singular and beautiful creatures as it is in the act of crossing a path, it may, if you are very cautious and gentle, perhaps allow you to come near, or even to stroke it; it is a brave little thing, and will not always run away.

What a pity that anyone should ever think of molesting the little miner which was created to turn the dull, dark, lonely earth into a cheerful home for himself and his family!

The great God loves to fill every corner of the ground full of happy creatures, that He may not look down upon any sad, empty, dreary spot; so He formed this little animal to be gay as well as useful where no other creature could live. We must not interfere with His loving plan more than we can help; since He has delivered His creatures, for the time, into our hands.

A merry skylark one bright morn
Dropped from the clouds into the corn
  Down to its nest so sweet,
    And spied a hole
    Where a busy mole
  Was delving at its feet.

"Poor little miner in the dark,
I pity you," began the lark,
    "For all you have to bear!
    No song, no light!—
    Such a wretched plight
  Would drive me to despair!

"All by yourself in dismal gloom,
Your days spent in a living tomb,
  How can you find a mate?
    Or food to eat—
    Any pleasant treat—
  Or dew, your thirst to sate?"

As he sank down from light of day,
The mole seemed to himself to say,—
"That bird's fate must be sad;
Up in that glare,
How ill I should fare;
It soon would drive me mad!

"I never should know a moment's rest,
Had I no shelter but a nest!
My fort so strong I dug,
Where my furry wife,
Joy of my life,
And babes lie safe and snug.

"None but the mole in comfort dwells
And hunts his prey and digs his wells—
At least that's what I say;
Charming diet,
And all so quiet!
No noisy dazzle of day."

So, happy the mole as heart could wish,
Happy the lark, and gay the fish,
Happy as words can say!
The bliss God gave
In wood and wave
Let not man take away.

## QUESTIONS.

Q. 1. Where was the mole intended to live?

A. In the ground.

Q. 2. In what ways is he specially fitted for dwelling there?

A. He has a cone-shaped body, a nose with an elastic gristly tip, strong paddles or hands for digging, and fur which has no "set" or bias.

Q. 3. What is meant by having no bias or set?

A. That the fur may be rubbed or smoothed in any direction without roughening it or annoying the skin.

Q. 4. Does the mole make anything besides burrows?

A. Yes. He makes a fort or keep.

Q. 5. How many galleries has the mole in his fort or keep?

A. Two galleries joined together by five passages.

Q. 6. What is the use of the keep?

A. It is a place of refuge for the mole.

Q. 7. What enemies has the mole under ground?

A. The weasel and other moles.

Q. 8. What enemies has he above ground?

A. Dogs and men.

Q. 9. What does the mole do to help the farmer?

A. He drains the ground by his tunnels, lets in air, and does good by eating grubs and worms.

Q. 10. How may mole-casts be made harmless?

A. By scattering the loose earth abroad with a spade or rake.

Q. 11. Is the mole an unhappy creature?

A. No. He is quite as happy as a bird, a fish, or any other creature.

Q. 12. Is he a slow creeping creature?

A. No. He can dart along his tunnels so swiftly as to keep pace with a horse trotting above.

THE END.

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